POGO MINE
SUMITOMO METAL MINING POGO LLC
MINING DONE RIGHT

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May 14, 2013
COR-13-031
**Certified Mail #7011 1570 0001 1569 9126**

Director, Air and Waste Management Division
United States Environmental Protection Agency
1200 Sixth Avenue
Seattle, Washington 98101

**SUBJECT: Sumitomo Metal Mining Pogo LLC, Petition Pursuant to 40 CFR 60.2115**

Dear Sir or Madame:

Sumitomo Metal Mining Pogo LLC (Pogo) plans to conduct a comprehensive source testing program to measure emissions of regulated pollutants from its solid waste incinerator. The source testing effort is scheduled for the week of **June 24 - 29, 2013.**

The incinerator is a new, state-of-the art propane-fired unit manufactured and installed by ACS, Inc. Because the incinerator does not currently use a wet scrubber, fabric filter, activated carbon injection, selective noncatalytic reduction, or an electrostatic precipitator, Pogo hereby submits for your approval two copies of a petition as specified in 40 CFR 60.2115.

The enclosed petition identifies the process parameters which Pogo proposes to use as additional operating limits, as well as discussions regarding those parameters and operating limits as specified in paragraphs (b) through (e) of §60.2115.

Pogo's location in a remote region of Alaska significantly limits our ability to retain qualified source-test contractors, as well as our scheduling options, for such a large and complex testing program within a small, summer-weather window. Pogo greatly appreciates your timely consideration of this petition as the test program is scheduled to begin in approximately 6 weeks.

If you have any questions, please give me a call at (907) 895-2879 or email me at sally.mcleod@smmpogo.com.

Sincerely,

Sally McLeod

Sally McLeod, CEM, REM
Environmental Superintendent

cc: John Kuterbach, ADEC

Attm: Pogo Initial CISWI Performance Test Operating Limits Petition

**Pogo Mine**
**Initial CISWI Performance Test**
**Incinerator Parameters / Operating Limits Petition**

Sumitomo Metal Mining Pogo LLC (Pogo) operates a small remote incinerator that is subject to 40 CFR 60 Subpart CCCC, *Standards of Performance for Commercial and Industrial Solid Waste Incineration Units* (CISWI Units). Because construction of this incinerator commenced after May 20, 2011, it is defined in §60.2015(a)(1) as a new CISWI unit.

According to §60,2015(a), the incinerator is subject to the emission limits in Table 8 of Subpart CCCC. Pogo intends to conduct source testing during the week of **June 24 - 28, 2013** to quantify emissions from the incinerator. Emissions are limited by proper operation and maintenance of the incinerator according to the manufacturer's specifications, and no add-on control device is utilized. As required by §60.2115, Pogo hereby petitions the EPA Administrator for specific operating limits to be established during the initial performance test and continuously monitoring thereafter.

The subject incinerator is an ACS Inc. Model PC 0400-VO5-RC6 with a burn rate of 480 lb/hr (type 2 waste). The unit has one 800,000 Btu/hr primary chamber propane burner, and two 800,000 Btu/hr secondary chamber propane burners. Both chambers are equipped with modulating combustion air blowers.

The following paragraphs provide the information specified in §60.2115(a) through (e).

1. The following parameters are identified for use as operating limits[1]:

- Individual Batch Load Weight: maximum load = 150 pounds
- Set Point: Load Interval: 15 minutes
- Set Point: Temperature of Primary Combustion Chamber = 1,200$^{o}$F
- Set Point: Burn Time of Primary Combustion Chamber = 5 hours
- Set Point: Temperature of Secondary Combustion Chamber = 1,832$^{o}$F
- Set Point: Burn Time of Secondary Combustion Chamber = 1 hour

2. The following discussion presents a brief description of the incinerator combustion process, the relationship between emissions of regulated pollutants and the parameters identified above, how emissions of these pollutants change with changes in these parameters, and how limits on the these parameters will serve to limit emissions of regulated pollutants.

[1] Other than batch weight, the operating limits are based on the manufacturer's operating parameters. Burn times and load intervals are default settings, minimum primary oven temperature is the default "Primary Burner On" setting, and minimum secondary oven temperature is the default "Secondary Burner Mod" temperature (Attachment 1, ACS Operating Instructions, Section 2.3). Maximum waste-load capacity is specified in the manufacturer's Incinerator (Attachment 1, ACS Operating Instructions, Section 3.4.1.2).

## 2.1 Combustion Process Description

Emissions of regulated pollutants are minimized through proper and complete combustion of waste in the incinerator. The burnable, hydrocarbon constituents of the waste, as well as intermediate compounds formed as the waste is heated, are ideally oxidized to form carbon dioxide and water vapor, while the inert constituents are reduced to ash. Combustion is conducted in two parts within the primary combustion chamber and the secondary combustion chamber.

### 2.1.1 Primary Combustion Process

In the primary combustion step, the thermal destruction of solid waste is accomplished in four phases: (1) drying, (2) volatilization of vapors and gases, (3) in-place oxidation of burnable solids, and 4) final burn-down of char and the consolidation and cooling of inert residues (i.e., bottom ash).

- The drying phase occurs in the initial heating of the waste material in the primary oven. Moisture is driven off as the material is heated past the vaporization temperature of water. Drying is usually complete by the time the material has reached 300$^{o}$F.
- In the second phase, vapors and gases diffuse out as the material temperature increases and their respective volatilization temperatures are reached. Gases having lower flash points react with primary combustion air to burn at the surface of the waste-bed. Higher flash point gases are most likely to burn after they have been entrained in the air flow and ignite when exposed to their respective ignition temperatures. Because the flash points of these gases range between approximately 500$^{o}$F and 1,300$^{o}$F, combustion occurs some distance above the bed where sufficient temperature and oxygen are present.
- Through further heating in the third phase, the remaining, partially oxidized cellulose, lignins, and other hydrocarbon solids are oxidized to form carbon dioxide and water vapor. The residues from this phase are incompletely burned hydrocarbons (char) and inert non-combustibles.
- In the fourth phase of the combustion process, the final burn-down of the char and the consolidation of the inert materials take place. After a short cooling period, this residual bottom ash is dropped into the ash-receiving system.

### 2.1.2 Secondary Combustion Process

Secondary combustion completes the final destruction of the waste. The secondary combustion zone provides the desired temperature, turbulence and excess air required to completely oxidize all the unburned vapors, gases, and particulates released from the primary combustion process. For this reason, the secondary chamber is designed with a sufficient volume to ensure the high-temperature residence time required to complete the oxidation of the most difficult to burn materials (i.e., high-flash-point and low-heat-content vapors).

## 2.2 Incinerator Operating Parameters and Pollutant Emissions

The ACS, Inc. PC 0400 Incinerator is automatically controlled according to pre-set operating parameters entered and confirmed by the manufacturer during annual inspection and maintenance procedures. The operating set points are password protected and are not changed by Pogo operators. These operating parameters include, among others, the primary and secondary burn times (hours), the load interval time (minutes), and the primary and secondary oven temperatures ($^{o}$F).

- The primary burn-down cycle is controlled by the electronic control unit. The burn-down timer is automatically reset each time the waste-loading sequence is completed, ensuring that the primary combustion chamber continues operating until the final load is followed by a complete, 5-hour burn-down cycle.
- The secondary chamber is heated to its operating temperature during incinerator startup, and is maintained at full operating conditions throughout the entire primary burn-down cycle. However, the timer that initiates the 1-hour secondary burn cycle is only started after the final (5-hour) primary burn-down period ends, ensuring that all waste loads undergo a complete secondary burn period.
- The control unit also resets the load interval timer after each waste-loading sequence is completed, preventing premature charging of the primary oven.
- The control unit automatically maintains oven temperatures by modulating the auxiliary burners and the combustion air blowers in each chamber.

The first parameter chosen to be used as an operating limit is the weight of each load charged into the incinerator. The individual load limit has been set to the manufacturer's specified capacity of 150 lb/load (see Attachment 1, ACS, Inc. Operating Instructions). The weight of each load will be measured and recorded during all incinerator operations. Limiting load weight such that it does not the exceed design capacity will ensure proper combustion according to the manufacturer's design, within the prescribed burn times and temperatures. Exceeding the maximum load capacity may potentially increase emissions of regulated pollutants. Therefore complying with this operating limit will serve to limit emissions of regulated pollutants.

The load interval parameter corresponds to an operating limit set point of 15 minutes between loads. Limiting the load interval to no less than 15 minutes ensures proper combustion can be achieved according to the manufacturer's design. The load interval is a factory-entered set point that is not modified by Pogo (See Attachment 1, Operating Parameters Table from the ACS, Inc. Operating Instructions.) During each incinerator start-up sequence, the operator will access the Operator Interface Terminal (OIT), record the load-interval setting, and confirm it is not less than 15 minutes. Reducing the load interval between waste charges may exceed the design capacity, potentially increasing emissions of regulated pollutants. This operating limit will serve to limit emissions of regulated pollutants by ensuring the period of time between waste loads is not reduced below the minimum design interval.

The incinerator is designed to achieve and maintain proper combustion conditions for optimal oxidization of burnable waste constituents into carbon dioxide and water vapor for the maximum load capacity and

minimum load interval described above. The key parameters indicating maintenance of proper combustion are the burn time and temperature in each chamber.

The primary oven temperature has a factory entered set point of 1,200°F (see Attachment 1, ACS Operating Instructions, Operating Parameters, "Primary Burner On" temperature). This set point maintains the primary oven operating temperature at or above the set point to ensure proper and complete primary burn-down. The primary burn-cycle time is factory-set to 5 hours following the introduction of the final batch-load of waste. Pogo does not change these factory set points. During each incinerator start-up sequence, the operator will access the OIT, record the primary oven temperature, and burn time settings and confirm they are not less than 1,200°F and 5 hours, respectively. Reducing either the primary oven temperature or the primary burn-down time may lead to increased emissions of regulated pollutants due to incomplete combustion of the waste. These two operating limits will serve to ensure complete combustion is achieved, thereby limiting emissions of regulated pollutants.

Similarly, the secondary oven temperature has a factory entered set point of 1,832°F ((see Attachment 1, ACS Operating Instructions, Operating Parameters, "Secondary Burner Mod" temperature). This set point maintains the secondary oven operating temperature at or above the set point to ensure proper and complete oxidation of vapors and gases that exit the primary chamber. The secondary burn-cycle time is factory-set to 1 hour following the completion of the primary burn cycle. Pogo does not change these factory set points. During each incinerator start-up sequence, the operator will access the OIT, record the secondary oven temperature, and burn time settings and confirm they are not less than 1,832°F and 1 hour, respectively. Reducing either the secondary oven temperature or the secondary burn-down time may lead to increased emissions of regulated pollutants due to incomplete combustion of some remaining gases exiting the primary combustion process. These two operating limits will serve to ensure complete combustion is achieved, thereby limiting emissions of regulated pollutants.

3. This section contains a discussion of how the upper and/or lower values will be established for the five operating parameters identified in Section1, above.

- The individual load weight has an upper value only. The maximum allowable load weight has been set equal to the manufacturer's design capacity for this parameter, i.e., 150 lb/load. The primary and secondary chambers were designed with sufficient volume to effectively incinerate this maximum quantity per load, for a given load interval. The design capacity is an upper bound: loads having lower weights will not adversely impact the incinerator's ability to achieve proper and complete combustion.
- The load interval has a lower value only. The manufacturer's default 15-minute load interval, a factory setting, provides sufficient time between waste-loads to ensure complete combustion. The load interval is a lower bound only: increasing the interval of time between loads will not adversely impact the unit's ability to achieve proper and complete combustion.
- The primary oven temperature, the manufacturer's set point, is a lower value only. The electronic control unit automatically activates the primary burners when the oven temperature drops to 1,200°F, thus maintaining the primary oven at or above the minimum design temperature.

- The primary burn-down time is the manufacturer's set point which defines a lower value. The electronic control unit automatically restarts the primary burn timer after each loading sequence is completed, and therefore the final load undergoes a 5-hour primary burn cycle.
- The secondary oven temperature, the manufacturer's set point, is a lower value only. The electronic control unit automatically modulates the secondary burners to maintain the minimum design temperature of 1,832$^{o}$F in the secondary oven.
- The secondary burn time is the manufacturer's set point which defines a lower value. The electronic control unit automatically starts the secondary burn timer after the primary timer indicates the end of a complete 5-hour primary burn cycle, and therefore the secondary chamber continues to operate through a preset, 1-hour burn cycle.

4. The methods and instruments to be used for measuring the parameters are discussed below.

- Batch Load Weight. Each batch of waste is weighed immediately prior to loading on a Cardinal Model No. 205 electronic weight indicator connected to a Cardinal Model SB-2500S scale. The scale has an accuracy of $\pm$10 percent, or better, of the waste load capacity.
- Load Interval, Primary and Secondary Burn Times. The automatic, computer-based control unit incorporates internal electronic timers that are extremely accurate.
- Primary and Secondary Burn Temperatures. The electronic control unit responds to temperature measurements of Type K thermocouples in each chamber. The Type K thermocouple has an accuracy of $\pm$0.4 percent at the set-point temperatures of the primary and secondary chambers.

5. The following paragraphs discuss the frequency and methods for recalibrating instruments to be used for monitoring parameters.

- On an annual basis, Pogo uses certified standard weights to confirm the scale's accuracy is $\pm$10 percent of the incinerator's individual load capacity.
- ACS, Inc. performs an annual inspection and maintenance service on the incinerator during which all systems, including the electronic timers, are verified for accuracy.
- ACS, Inc. performs an annual inspection and maintenance service on the incinerator during which the thermocouples are checked for accuracy and replaced as necessary.

**Attachment 1**

**ACS, Inc. Operating Instructions**

ACS, INC.
ADVANCED COMBUSTION SYSTEMS
ADVANCED CONTROL SYSTEMS
*DIVISIONS OF ACS, INC.*
1999 ALPINE WAY ● BELLINGHAM, WA 98226 PHONE: (360) 676-6005 ● FAX: (360) 647-9439

# OPERATING INSTRUCTIONS

## PC0400-V05-RC6

## INCINERATOR

## UNITED INFRASTRUCTURE PROJECTS

# JOB NO. 9297

## July 7, 2010

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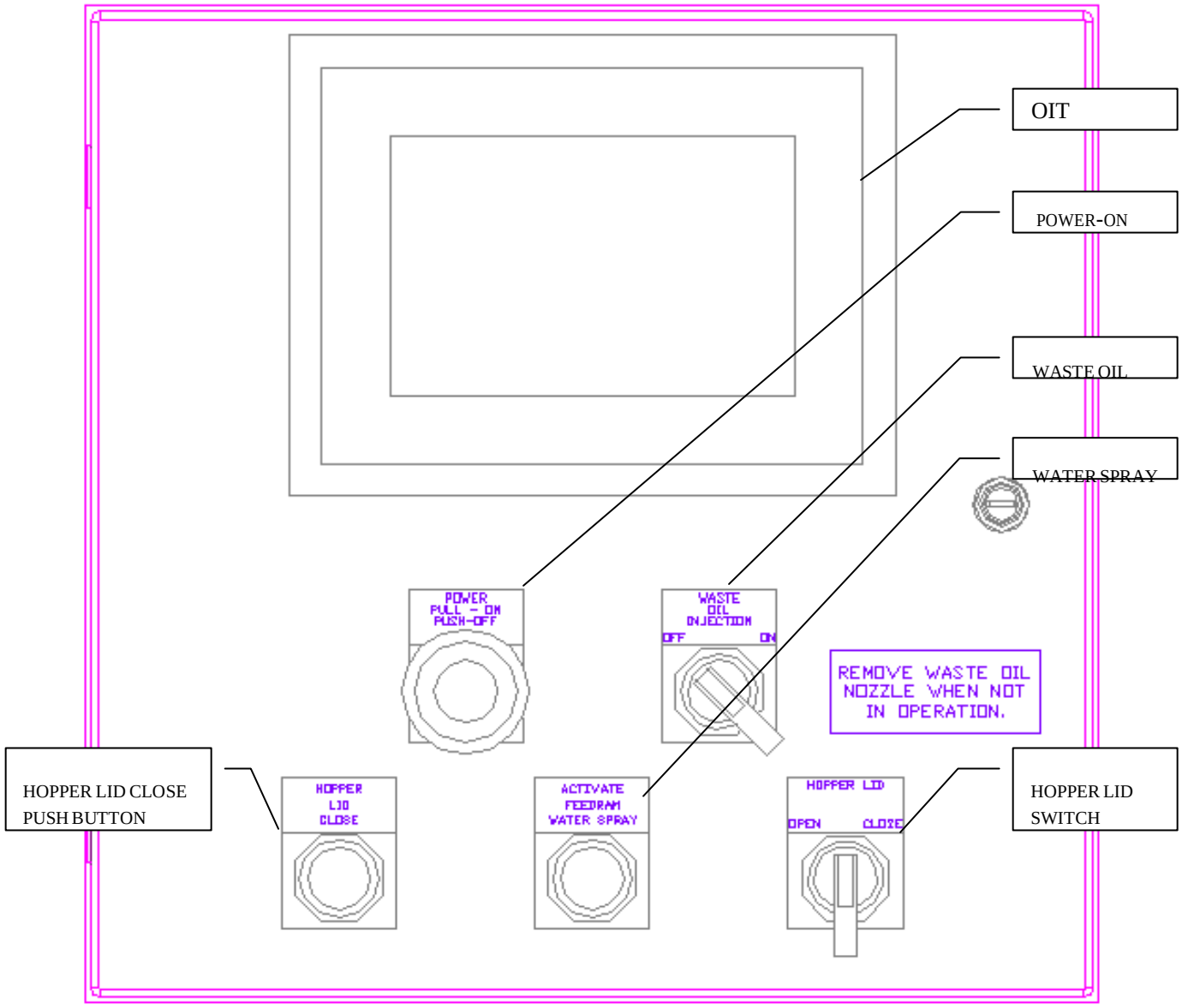
# INCINERATOR OPERATION

BEFORE THE INCINERATOR CAN BE PUT INTO OPERATION THE REFRACTORY LINING MUST BE CURED. PROCEDE TO CHAPTER 7 AND BECOME COMPLETELY FAMILIAR WITH THE OPERATOR INTERFACE TERMINAL AND, IN PARTICULAR, THE FUNCTIONS OF THE CURING MODE SCREEN, BEFORE ATTEMPTING TO CURE-OUT OR OPERATE THIS INCINERATOR. READ CHAPTER 7 FIRST, AND THEN READ THE REST OF THIS MANUAL.

## 1. OPERATOR CONTROL PANEL

### 1.1. OPERATOR CONTROLS




1.1.1. **POWER-ON.** This pushbutton is an illuminated, two-position, maintained, mushroom head style pushbutton. Pulling on the button applies electrical power to the control circuit and illuminates the internal light. Pushing on the

button removes power from the control circuit and extinguishes the internal light.

1.1.2. **WASTE OIL INJECTTION**. This switch is a maintained, two-position selector switch. When set to the OFF position, the oil injection system is completely de-energized and all of its associated alarms are disabled. When set to the ON position, the oil injection system, along with its associated alarms, is enabled. Any time the incinerator is on and the oil injection system is on, the oil pump and oil heater will be energized to circulate and heat the waste oil. If the oil injection nozzle is in place, Primary Burner #1 is energized, and the air compressor is operational, the oil injection valve will energize to allow waste oil to be injected into the incinerator for its disposal by combustion.

1.1.3. **HOPPER LID CLOSE**. This pushbutton is used in conjunction with the hopper lid switch to establish two-hand control when closing the hopper lid. This pushbutton must be held down while closing the hopper lid.

1.1.4. **HOPPER LID OPEN-CLOSE**. This switch is a three-position, spring-to-center, knob style selector switch. When held in the OPEN position the hopper lid will open. When held in the CLOSE position in conjunction with pressing the hopper lid close pushbutton, the hopper lid will close. Releasing this switch stops the hopper lid movement.

1.1.5. **FEEDRAM WATER SPRAY**. This pushbutton activates the Feedram water spray system. Holding down this button energizes the water spray solenoid. Releasing the button de-energizes the water spray solenoid.

## 1.2. OPERATOR INTERFACE TERMINAL (OIT)

1.2.1. The *Operator Interface Terminal* (OIT) provides the user with additional operator controls plus the incinerator's status, temperatures, modes, alarms, operating parameters and other pertinent information. The complete function and use of the OIT is described in detail in chapter 7.

1.2.2. **HYDRAULIC PUMP HAND-OFF-AUTO**. This is a three-position, press-to-select button array located on the "RAM" screen of the Operator Interface Terminal (OIT). In the HAND position the hydraulic pump will energize and remain energized until it is turned off. In the OFF position the hydraulic pump is disabled. In the AUTO position the hydraulic pump will automatically energize and de-energize as required. To activate hydraulically actuated devises, this switch must be in the HAND or AUTO position. This switch is normally left in the AUTO position.

1.2.3. **CHARGE DOOR OPEN-CLOSE**. Momentary pushbuttons located on the "RAM" screen of the OIT. When the OPEN button is pressed the charge door will open. When the CLOSE button is pressed the charge door will close. Releasing the buttons stops all charge door movement.

1.2.4. **FEEDRAM EXTEND-RETRACT**. Momentary pushbuttons located on the "RAM" screen of the OIT. When the EXTEND button is pressed the Feedram will extend. When the RETRACT button is pressed the Feedram will retract. Releasing the buttons stops all Feedram movement.

# 2. PRE-STARTUP

## 2.1. DAILY INSTPECTION CHECK LIST

2.1.1. **FUEL SUPPLY**. Ensure there is an adequate supply of fuel that will last for the intended duration of incinerator operation.

2.1.2. **FUEL VALVES**. Ensure all fuel supply valves are open, both inside and outside of the container.

2.1.3. **WATER VALVE**. Ensure the water supply valve is open and that water is being supplied to the unit.

2.1.4. **ELECTRICAL SUPPLY**. Ensure the electrical connector is securely connected to its receptacle.

2.1.5. **CIRCUIT BREAKERS**. Ensure all the circuit breakers in the Panel Board (circuit breaker box) located at the rear of the incinerator are turned on.

2.1.6. **HYDRAULIC RESERVOIR LEVEL**. Ensure the hydraulic fluid level in the reservoir is at the proper level as indicted on the level sight gauge. If hydraulic fluid needs to be added, thoroughly inspect all hydraulic lines and connections for leaks.

2.1.7. **AIR COMPRESSOR DRAIN**. Drain the water from the air compressor daily. Ensure the air compressor is plugged in and turned on and that the outlet pressure is set at 60 psi.

2.1.8. **WASTE OIL SUPPLY**. Ensure there is an adequate supply of waste oil in the storage tank for the intended duration of incineration. If there is not an adequate supply of waste oil:

**TURN THE WASTE OIL INJECTION SYSTEM OFF**

**REMOVE THE WASTE OIL NOZZLE FROM ITS BURN-TUBE**

Only install the waste oil nozzle in its burn-tube when it is going to be used. Leaving the nozzle in the burn-tube without operating it may damage the nozzle.

2.1.9. **WASTE OIL FILTER**. Check the waste oil filter gauge for a filter dirty indication each time that the waste oil system is used. Failure to replace a dirty oil filter can damage the waste oil pump and oil heater.

2.1.10. **VENTILATION**. If the ambient temperature is above 86°F (30°C) open the doors at both ends of the container.

2.1.11. **GENERAL INSPECTION**. Inspect the incinerator shell for “hot spots” (paint discoloration), which is an indication that refractory may have deteriorated and repairs are needed. Look for fuel leaks around the burners and fuel lines. After starting the incinerator, listen for odd sounds that may indicate that a component is in need of maintenance.

2.1.12. **PRIMARY CHAMBER DOOR.** Ensure the primary chamber door is closed and secured.

## 2.2. POWER UP

2.2.1. Pull the [**POWER ON**] button located on the front of the control panel.

2.2.1.1. The internal light will illuminate to indicate that control power is on.

2.2.1.2. The Operator Interface Panel will illuminate, and after a short delay, a "start-up dialog box" will be displayed. You can either press the [START] button within this dialog box, or simply wait a few seconds for the MAIN SCREEN to be displayed.

2.2.2. Waste Oil Injection System.

2.2.2.1. If Waste Oil is available, install the injection nozzle in its burn tube, then turn the WASTE OIL INJECTION switch to ON. If waste oil is not available, turn the injection system off, remove the nozzle from the burn tube and place it in its holder, then close off the burn tube with the dust cap.

2.2.2.2. If the waste oil system is used, check the filter gauge for a "filter dirty" indication after the incinerator has been started and the oil pump energizes.

**DO NOT OPERATE THE SYSTEM WITH A DIRTY FILTER**.

## 2.3. OPERATING PARAMETERS

2.3.1. Enter or verify the desired *Operating Parameter Settings* on the Operator Interface Terminal. The following tables list the operating parameters, along with their factory default settings.
(*see section 7 for instructions on changing the operating parameters*)

**Feedram Screen**

| PARAMETER | DEFAULT | UNITS Opt 1 | MIN Opt 2 | MAX Opt 3 |
|---|---|---|---|---|
| Hydraulic Pump | Auto | Hand | Off | Auto |
| Load Interval Time | 15.0 | Minutes | 6.0 | 54.0 |

**Primary Parameters Screen 1**

| PARAMETER | DEFAULT | UNITS Opt 1 | MIN Opt 2 | MAX Opt 3 |
|---|---|---|---|---|
| Purge Time | 1.0 | Minutes | 1.0 | 54.0 |
| Primary Burn Time | 5.0 | Hours | 0.1 | 54.0 |
| Cool-Down Time | 4.0 | Hours | 0.1 | 54.0 |
| Waste Oil Off | 900 (1650) | °C (°F) | 0 | 1300 (2300) |
| Water Off | 920 (1690) | °C (°F) | 0 | 1300 (2300) |
| Water On | 925 (1700) | °C (°F) | 0 | 1300 (2300) |

**Primary Parameters Screen 2**

| PARAMETER | DEFAULT | UNITS Opt 1 | MIN Opt 2 | MAX Opt 3 |
|---|---|---|---|---|
| Primary Warm-up Cycle | On | Off | On | |
| Primary Warm-up | 425 (800) | °C (°F) | 0 | 1300 (2300) |
| Primary Burner On | 650 (1200) | °C (°F) | 0 | 1300 (2300) |
| Primary Burner Mod | 675 (1250) | °C (°F) | 0 | 1300 (2300) |
| Primary Burner Off | 815 (1500) | °C (°F) | 0 | 1300 (2300) |
| Primary Over Temperature | 980 (1800) | °C (°F) | 0 | 1300 (2300) |
| | | | | |

**Primary Parameters Screen 3**

| PARAMETER | DEFAULT | UNITS Opt 1 | MIN Opt 2 | MAX Opt 3 |
|---|---|---|---|---|
| Primary Blower Mod | 815 (1500) | °C (°F) | 0 | 1300 (2300) |
| Primary Blower On | 865 (1590) | °C (°F) | 0 | 1300 (2300) |
| Primary Blower Off | 870 (1600) | °C (°F) | 0 | 1300 (2300) |
| Primary Blower Off/On | ON | OFF | ON | |
| Primary Blower Mode | AUTO | HAND | AUTO | |
| Primary Blower Hand Speed | 50 | % | 25 | 100 |

**Secondary Parameters Screen 4**

| PARAMETER | DEFAULT | UNITS Opt 1 | MIN Opt 2 | MAX Opt 3 |
|---|---|---|---|---|
| Secondary Burn Time | 1.0 | Hours | 0.1 | 54.0 |
| Secondary Warm-up | 980 (1800) | °C (°F) | 0 | 1300 (2300) |
| Secondary Burner Mod | 1000 (1832) | °C (°F) | 0 | 1300 (2300) |
| Secondary Blower Mod | 1005 (1840) | °C (°F) | 0 | 1300 (2300) |
| Sec Orifice Blower Mod | 1010 (1850) | °C (°F) | 0 | 1300 (2300) |
| Secondary Over Temperature | 1100 (2000) | °C (°F) | 0 | 1300 (2300) |

## 2.4. OPERATING MODE

2.4.1. From the MENU SCREEN of the OIT, select either the NORMAL OPERATING MODE or the WASTE OIL ONLY OPERATING MODE by pressing the MODE select pushbutton. Each time the button is pressed, the mode will toggle from one mode to the other. The mode that is active is the mode that is displayed on the button, i.e., if NORMAL OPERATING MODE is displayed, then the incinerator is in the normal operating mode. Note the operating mode can only be changed when the incinerator is off.

2.4.1.1. **NORMAL OPERATING MODE**. Mode of operation where solid waste is fed into the incinerator using the feedram and waste oil is injected intermittently if the waste oil injection system is turned on.

2.4.1.2. **WASTE OIL ONLY MODE**. Mode of operation where waste oil is injected continuously and the feedram is disabled. No solid waste can be fed into the unit during this mode of operation. The primary chamber should be empty.

## 2.5. HYDRAULIC SYSTEM INITIALIZATION

2.5.1. The hydraulically actuated components of the feed system must be in their "home" positions before the incinerator can be started. The positions of the feed system components can be checked from the RAM screen of the Operator Interface Terminal (OIT). The "home" positions for the components are as follows:

- FEEDRAM: RETRACTED
- HOPPER LID: CLOSED
- CHARGE DOOR: CLOSED

2.5.2. Set the HYDRAULIC PUMP switch to AUTO.

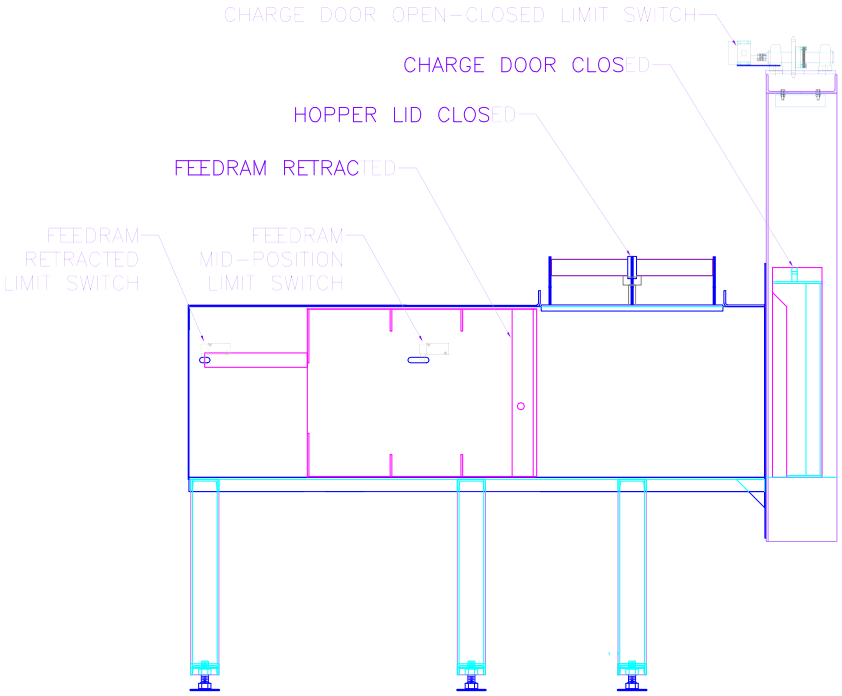
2.5.3. CLOSE the HOPPER LID.

2.5.4. RETRACT the FEEDRAM to HOME. If the feedram will not retract, open the charge door completely, and then retract the feedram to its home position.

2.5.5. CLOSE the CHARGE DOOR.

2.5.6. Note the feedram and the charge door are interlocked with the "feedram mid-position" limit switch and the "charge door open" limit switch.

- The feedram will not extend unless the charge door is fully open.
- If the feedram has travelled further than the mid-position limit switch the charge door will not close.
- If the feedram has travelled further than the mid-position limit switch the feedram will not retract unless the charge door is fully open.
- The charge door will not close until the feedram is retracted far enough back to trip the mid-position limit switch.



# 3. NORMAL OPERATING MODE

## 3.1. OPERATING MODE SELECTION

3.1.1. From the MENU SCREEN of the Operator Interface Terminal, ensure the button in the lower right hand corner reads **NORMAL OPERATING MODE**. If it does not, press the button once to toggle it to read NORMAL OPERATING MODE.

## 3.2. START-UP

3.2.1. From the MAIN SCREEN of the Operator Interface Terminal, press the button labeled [**START INCINERATOR**].

3.2.1.1. The incinerator will start and initiate the following sequence of operation.

## 3.3. SEQUENCE OF OPERATION

3.3.1. **Initialization**

3.3.1.1. Combustion Air Louver opens and remains open until the end of the cool-down cycle or until the incinerator is turned off.

3.3.1.2. Waste Oil Pump and Heater energize to heat the waste oil to its operating temperature if the Waste Oil Injection System is turned on.

3.3.2. **Purge Cycle Initiated.**

3.3.2.1. Primary blower is energized and delivers 100% airflow to purge any combustible gasses from the chamber.

3.3.2.2. OIT status reads: PURGE CYCLE.

3.3.3. **Purge Cycle Complete.**

3.3.3.1. Primary blower is de-energized.

3.3.4. **Warm Up Cycle Initiated.**

3.3.4.1. Secondary burners energize and are modulated to high fire to bring the secondary chamber up the *Secondary Warm-Up* temperature setting.

3.3.4.2. If the primary warm-up cycle is turned on, the primary burners energize and modulate to high fire to bring the primary chamber up to the *Primary Warm-Up* temperature setting.

3.3.4.3. OIT status reads: WARM-UP CYCLE.

3.3.5. **Warm Up Cycle Complete.**

3.3.5.1. Primary burners modulate (or cycle on and off) to maintain the primary chamber at the *Primary Burner Mod* temperature setting.

3.3.5.2. Secondary Burners modulate to maintain the secondary chamber at the *Secondary Burner Mod* temperature setting.

3.3.5.3. Secondary Blower is energized and modulated to maintain secondary chamber at the *Secondary Blower Mod* temperature setting.

3.3.5.4. OIT status reads: PRIMARY BURN CYCLE.

## 3.4. CONTINUOUS WASTE LOADING

3.4.1. **Initial Waste Load.**

3.4.1.1. Hold the hopper lid switch in the open position until the hopper lid is fully open.

3.4.1.2. Fill the hopper with no more than 68 kg (150 lb) of waste.

3.4.1.3. Hold the HOPPER LID switch in the CLOSE position while simultaneously pressing the HOPPER LID CLOSE pushbutton until the hopper lid is fully closed.

3.4.1.4. Automatic Loading Sequence starts:

3.4.1.4.1. OIT status reads: LOAD CYCLE.

3.4.1.4.2. Primary Burners and Blower are disabled.

3.4.1.4.3. Charge door opens.

3.4.1.4.4. Feedram extends to push waste into primary chamber.

3.4.1.4.5. Feedram retracts to mid-position.

3.4.1.4.6. Charge door closes.

3.4.1.4.7. Feedram water face spray is energized.

3.4.1.4.8. Feedram retracts to its home position.

3.4.1.4.9. Hopper Lid opens.

3.4.1.4.10. Feedram disabled until load interval time expires.

3.4.2. **Primary Burn-down Cycle**.

3.4.2.1. OIT status reads: PRIMARY BURN CYCLE.

3.4.2.2. Primary burn-down timer is started.

3.4.2.3. Load interval timer is started.

3.4.2.4. Primary burners are enabled after a short time delay and modulated to maintain the primary chamber at its operating temperature.

3.4.2.5. Primary blower is energized and modulated to maintain the primary chamber at it s operating temperature if the blower is ON and set to AUTO.

3.4.3. **Repetitive Waste Loading**.

3.4.3.1. Immediately after waste has been loaded into the incinerator, or whenever the feed interval counter reads zero, the hopper can be re-

loaded with waste, where it will sit until the feed interval counter reaches zero and the next load cycle is initiated.

3.4.3.2. Follow the procedures outlined for initial waste loading whenever the feedram has finished a load cycle or the feed interval time on the OIT reads zero minutes remaining.

3.4.4. **Primary Burn-down Cycle Complete**. The primary burn-down cycle is complete when the primary burn-down timer has expired. Note the primary burn-down cycle timer is restarted every time the charge door is opened, so the burn-down timer always starts after the last load of the day is pushed into the incinerator.

3.4.5. **Secondary Burn-down Cycle**. The secondary burn-down cycle is initiated when the primary burn-down cycle is complete.

3.4.5.1. OIT status reads: SECONDARY BURN CYCLE.

3.4.5.2. Secondary Burn-down Timer is started.

3.4.5.3. Primary Burners are de-energized.

3.4.5.4. Primary Blower is energized at 100% capacity.

3.4.5.5. Secondary Burners and Blower continue to be modulated to maintain the secondary operating temperature to consume any residual waste gas from the primary chamber.

3.4.6. **Secondary Burn-down Cycle Complete**. The secondary burn-down cycle is complete when the secondary burn-down timer has expired. All secondary burners and blower are de-energized.

## 3.5. AUTOMATIC SHUTDOWN SEQUENCE

3.5.1. **Primary Cool-down Cycle**. The primary cool-down cycle is initiated when the secondary burn-down cycle is complete.

3.5.1.1. OIT status reads: COOL-DOWN CYCLE.

3.5.1.2. Primary Cool-down Timer started.

3.5.1.3. Secondary Burners and Blower are de-energized.

3.5.1.4. Primary Blower is energized at 100% capacity.

3.5.1.5. Primary chamber begins to cool.

3.5.2. **Primary Cool-down Cycle Complete**. The primary cool-down cycle is complete when the primary cool-down timer has expired.

3.5.2.1. Primary Blower is de-energized.

3.5.2.2. Incinerator Start light is extinguished.

3.5.2.3. OIT status reads: INCINERATOR OFF.

## 3.6. INCINERATOR STOP

3.6.1. **Incinerator Stop Button Activated**

3.6.1.1. All burners and blowers are de-energized.

3.6.1.2. All cycle counters and timers are reset.

3.6.1.3. OIT status reads: INCINERATOR OFF.

## 3.7. EMERGENCY STOP

3.7.1. **Control Power Button Pushed.**

3.7.1.1. Control power to the system is interrupted.

3.7.1.2. Main fuel valve is de-energized.

3.7.1.3. All burners, blowers, motors, pumps, fans and lights are disabled.

3.7.1.4. All switches and pushbuttons are non-functional.

# 4. WASTE-OIL-ONLY MODE OF OPERATION

## 4.1. OPERATING MODE SELECTION: WASTE-OIL-ONLY

4.1.1. Ensure the Waste Oil Nozzle is properly installed it its Burn Tube.

4.1.2. From the MENU SCREEN of the Operator Interface Terminal, ensure the MODE button in the lower right hand corner reads **WASTE OIL ONLY OPERATING MODE**. If it does not, press the button once to toggle it to read WASTE OIL ONLY OPERATING MODE.

4.1.3. OIT status reads: WASTE OIL ONLY MODE.

4.1.4. From the Operator Control Panel, place the WASTE OIL INJECTION switch to the ON position.

## 4.2. START-UP: WASTE-OIL-ONLY

4.2.1. From the MAIN SCREEN of the Operator Interface Terminal, press the button labeled [**START INCINERATOR**].

4.2.1.1. The incinerator will start and initiate the following sequence of operation.

## 4.3. SEQUENCE OF OPERATION: WASTE-OIL-ONLY

4.3.1. **Initialization**

4.3.1.1. Combustion Air Louver opens and remains open until the incinerator is turned off.

4.3.1.2. Waste Oil Pump and Heater energize to heat the waste oil to its operating temperature.

4.3.2. **Purge Cycle Initiated.**

4.3.2.1. Primary blower is energized and delivers 100% airflow to purge any combustible gasses from the primary chamber.

4.3.3. **Purge Cycle Complete.**

4.3.3.1. Primary blower remains at 100% airflow to keep the primary chamber as cool as possible.

4.3.3.2. Secondary blower energizes and modulates to maintain the secondary chamber at its modulation temperature setting.

4.3.3.3. When the waste oil reaches operating temperature Primary Burner #1 is energized.

4.3.3.4. After proof that Primary Burner #1 has fired the atomizing air valve is energized, and after proof that adequate air pressure is present the waste oil valve is energized to inject the waste oil into the incinerator for destruction.

4.3.3.5. If the primary chamber gets too hot and the temperature exceeds the *waste oil only setpoint*, the burner and waste oil valves will de-energize to allow the chamber to cool off before being re-energizing at the *primary burner on setpoint*.

4.3.3.6. The incinerator will continue to run indefinitely until the operator turns the incinerator off, or until the waste oil tank has been run dry, at which time the incinerator will turn off automatically.

## 4.4. INCINERATOR STOP: WASTE-OIL-ONLY

4.4.1. **Incinerator Stop Button Activated**

4.4.1.1. All burners and blowers are de-energized.

4.4.1.2. All cycle counters and timers are reset.

4.4.1.3. OIT status reads: WASTE OIL ONLY MODE.

*Note: The OIT status will always read "WASTE OIL ONLY MODE" when waste oil only mode is the selected mode of operation.*

# 5. INCINERATOR MANUAL OPERATION

All hydraulically actuated mechanisms can be operated manually with the incinerator on or off. In the event of a charge door blocked alarm, the Feedram must be operated manually to return it to its home position.

## 5.1. PRIMARY BLOWER

5.1.1. From the OIT parameter setup screen, set the PRIMARY BLOWER to ON and HAND. The primary blower will energize.

5.1.2. Set the PRIMARY BLOWER HAND SPEED setpoint to the desired value. Note the primary blower will not run slower than its minimum CV setpoint (see paragraph 7.13.6).

## 5.2. HOPPER LID

5.2.1. Place the HYDRAULIC PUMP switch to the HAND or AUTO position.

5.2.2. Use the HOPPER LID switch to OPEN the hopper lid.

5.2.3. Use the HOPPER LID switch in conjunction with the HOPPER LID CLOSE pushbutton to CLOSE the hopper lid.

## 5.3. CHARGE DOOR

5.3.1. Place the HYDRAULIC PUMP switch to the HAND or AUTO position.

5.3.2. Use the CHARGE DOOR buttons to OPEN and CLOSE the door.

5.3.2.1. The CHARGE DOOR will not close unless the Feedram is between its mid and home positions.

## 5.4. FEEDRAM

5.4.1. Place the HYDRAULIC PUMP switch to the HAND or AUTO position.

5.4.2. Use the FEEDRAM buttons to EXTENT and RETRACT the Feedram.

5.4.2.1. The charge door must be fully open to extend the Feedram.

5.4.2.2. The Feedram can be retracted from its mid-position with the charge door closed.

# 6. ALARMS

There are numerous alarms programmed into the system. See Appendix A for a complete list of the alarms. Alarms fall into two categories: Warning Alarms and Shutdown Alarms. A Warning Alarm will always precede a Shutdown Alarm. Warning alarms inform the operator that a critical parameter is approaching a dangerous level and some type of corrective action should be taken. If a warning alarm is ignored and the parameter reaches a dangerous level the system affected will be shut down.

With the exception of the CHARGING DOOR BLOCKED ALARM, the system will automatically handle all critical alarms by shutting down the affected component or system. Minor alarms simply disable the loading of waste into the incinerator.

When any alarm is first detected the alarm horn will sound. Acknowledging an alarm by pressing the **[ ! ]** button on the OIT alarm screen will silence the alarm horn..

## 6.1. SILENCING THE ALARM HORN

6.1.1. Press the **ACKNOWLEDGE ALARM** button **[ ! ]** when the OIT Alarm Screen is displayed. If a new alarm is detected before the previous alarm is cleared, the alarm horn will re-sound and need to be silenced again.

6.1.2. Some waste oil injection system alarms require that the WASTE OIL INJECT SWITCH be turned OFF to silence and reset the alarm.

## 6.2. CHARGE DOOR BLOCKED ALARM

If the CHARGE DOOR BLOCKED alarm is displayed the charging door has not fully closed during a load cycle. If the charging door fails to fully close during a load cycle the system will try to clear any debris preventing its closing by cycling the Feedram up to three times. If, on the fourth try, the charging door still fails to close completely the CHARGE DOOR BLOCKED alarm will be triggered. The operator must then manually clear the blockage by following this procedure:

6.2.1. Press the FEEDRAM WATER SPRAY pushbutton for several seconds to extinguish any flames that may be in the Feedram hopper.

6.2.2. Hold the FEEDRAM button in the RETRACT position until the Feedram is fully retracted (home).

6.2.3. Open the HOPPER LID slightly and check for any flames in the hopper. If flames are present, press the FEEDRAM WATER SPRAY pushbutton until they are extinguished.

6.2.4. Open the HOPPER LID fully only after all burning material has been extinguished.

6.2.5. Slightly raise the charging door just enough to facilitate clearing whatever material or objects are preventing it from fully closing.

6.2.6. Using a long handled scraper, clear the blockage from beneath the charging door. Most blockages are caused by the accumulation of melted plastic bags on the bottom of the charging door, which prevents it from fully closing. A defective or misaligned limit switch may also cause this problem.

6.2.7. Ensure the charging door fully closes.

# 7. OPERATOR INTERFACE TERMINAL

The Operator Interface Terminal (OIT) provides the user with system status, alarm annunciation, chamber temperatures, cycle times, incinerator controls, feedram controls and operating parameter entry.

## 7.1. TOUCH SCREEN

7.1.1. The Operator Interface screen is *touch-sensitive.* Pressing on the screen where a button, key, or numeric data entry object appears will cause that object to be activated. When an object is pressed its appearance will change to indicate that it has been activated.

**CAUTION**

Only use your bare fingers to press the buttons on the screen.
Never use a tool or any other object, as they may scratch or damage the screen.

## 7.2. SCREEN NAVIGATION

The screen navigation keys are always located at the bottom of each screen. They are used to move from one screen to another. Press and release a navigation key to activate it.

7.2.1. [**MAIN**] key display the main screen.

7.2.2. [**RAM**] key displays a menu screen that contains the feedram operating controls.

7.2.3. [**MENU**] key displays a menu screen that allows for changing operating modes and to allow access to advanced features normally only used during commissioning or maintenance.

7.2.4. [**NEXT**] key displays the next screen.

7.2.5. [**PREV**] key displays the previous screen.

## 7.3. POPUP KEYPAD

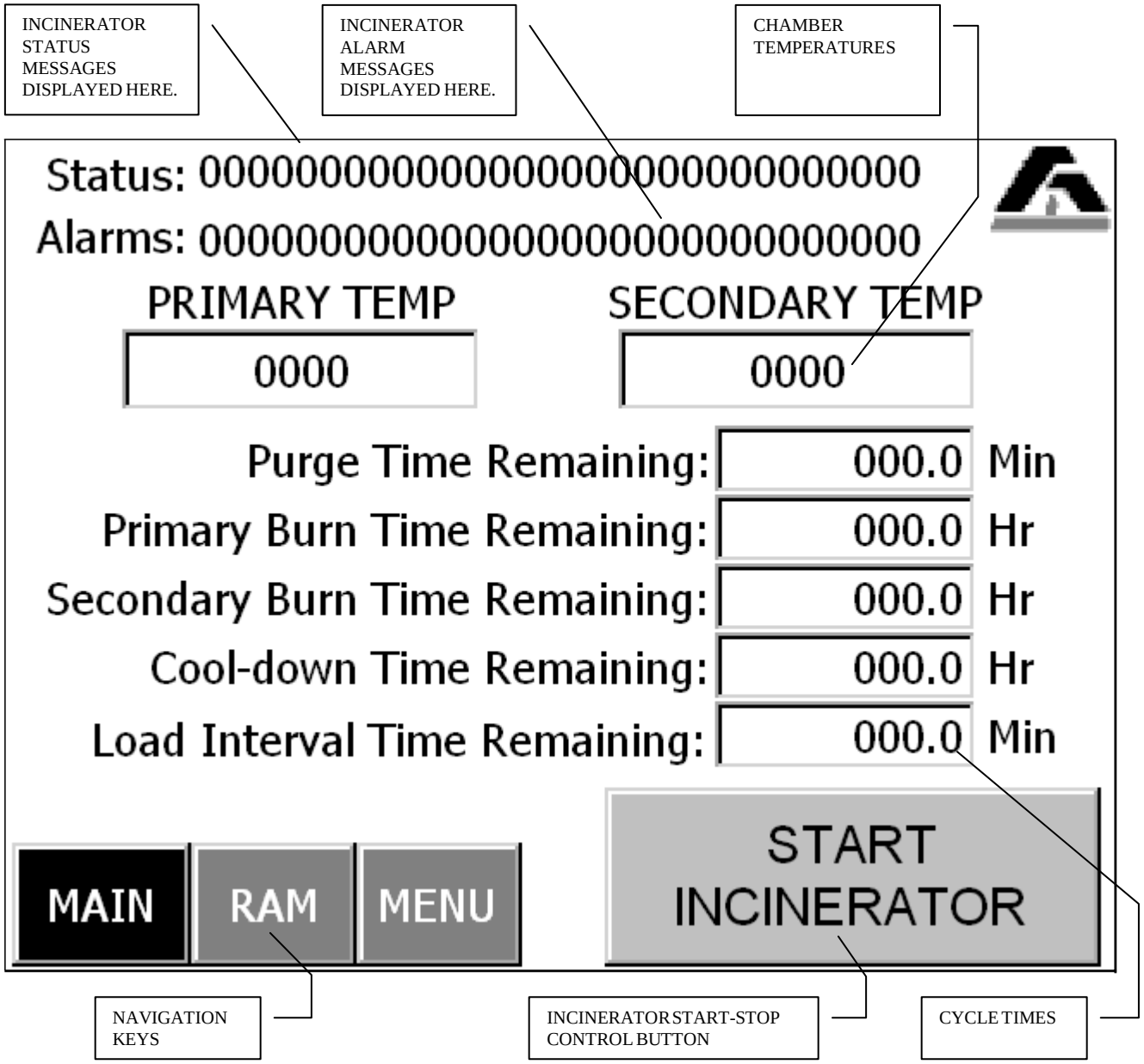
7.3.1. When a numeric entry object is activated a *popup keypad* will be displayed.

7.3.2. The initial entry value will be the current setpoint value. Use the numeric keys to enter the new value. If the value needs to be negative, press the minus key [-] either before or after you enter the new value. If you make a mistake, press the [BSP] (back space) key to erase the last digit(s) entered. You can press the [ESC] (escape) key at any time to close the keypad without changing the parameter value. When you are finished entering the new value, press the [↵] (enter) key.

7.3.3. If the value you entered is outside a preset limit, it will be replaced by that parameter's default value (refer to the parameter settings table in paragraph 2.3).

## 7.4. MAIN SCREEN

The MAIN SCREEN is the default screen at power-up. Incinerator status, alarm annunciation, cycle times, incinerator control and screen navigation keys are displayed on this screen. The MAIN SCREEN should always be selected during normal incinerator operation.




7.4.1. **STATUS**. The top line displays the incinerator status. The status messages displayed are as follows:

| | |
|---|---|
| INCINERATOR OFF | Incinerator is off. |
| PURGE CYCLE | Incinerator is in purge cycle |
| WARM-UP CYCLE | Incinerator is in warm-up cycle |
| LOAD CYCLE | Incinerator is loading waste |
| PRIMARY BURN CYCLE | Incinerator is in primary burn-down cycle. |
| SECONDARY BURN CYCLE | Incinerator is in secondary burn-down cycle. |
| COOL DOWN CYCLE | Incinerator is in cool-down cycle. |

| | |
|---|---|
| CURING MODE | Incinerator is in a curing mode. |
| WASTE OIL ONLY MODE | Incinerator is configured to burn waste oil only. |

7.4.2. **ALARMS**. The second line displays the incinerator alarms. If more than one alarm is active, the display will scroll through each alarm ever four seconds. The alarm messages that are displayed are as follows:

| | |
|---|---|
| DOOR OPEN | Primary chamber door is open. |
| PRIMARY BURNER #1 FAIL | Primary burner #1 failed. |
| PRIMARY BURNER #2 FAIL | Primary burner #2 failed. |
| SECONDARY BURNER #1 FAIL | Secondary burner #1 failed. |
| SECONDARY BURNER #2 FAIL | Secondary burner #2 failed. |
| PRIMARY THERMOCOUPLE OPEN | Primary chamber thermocouple open (failed). |
| SECONDARY THERMOCOUPLE OPEN | Secondary chamber thermocouple open (failed). |
| PRIMARY OVER-TEMPERATURE | Primary chamber over temperature. |
| SECONDARY OVER-TEMPERATURE | Secondary chamber over temperature. |
| PRIMARY BLOWER FAULTED | Primary blower motor overload relay tripped. |
| SECONDARY BLOWER FAULTED | Secondary blower motor overload relay tripped. |
| HYDRAULIC MOTOR OVERLOADED | Hydraulic pump motor overload relay tripped. |
| CHARGE DOOR BLOCKED | Charge door is blocked and will not close. |
| AIR COMPRESSOR PRESSURE LOW | Air compressor is unplugged or malfunctioned. |
| WASTE OIL NOZZLE NOT IN PLACE | Waste oil nozzle not installed properly. |
| WASTE OIL PUMP OVERLOAD | Waste oil pump motor overload relay tripped. |
| WASTE OIL TANK LEVEL LOW | Waste oil is at its low level in the tank. |
| WASTE OIL TEMPERATURE LOW | Waste oil is below operating temperature. |
| WASTE OIL SWITCH SET TO OFF | Waste oil only mode selected and waste oil switch off. |

7.4.3. **PRIMARY TEMP**. Display of the actual Primary chamber temperature in degrees Fahrenheit.

7.4.4. **SECONDARY TEMP**. Display of the actual Secondary chamber temperature in degrees Fahrenheit.

7.4.5. **PURGE TIME REMAINING**. Displays the time remaining in the purge cycle. When the value decrements to zero the cycle has completed.

7.4.6. **PRIMARY BURN TIME REMAINING**. Displays the time remaining for primary burn-down cycle. When the value decrements to zero the cycle has completed.

7.4.7. **SECONDARY BURN TIME REMAINING**. Displays the time remaining for secondary burn-down cycle. When the value decrements to zero the cycle has completed.

7.4.8. **COOL-DOWN TIME REMAINING**. Displays the time remaining for cool-down cycle. When the value decrements to zero the cycle has completed and the incinerator will automatically shut off.

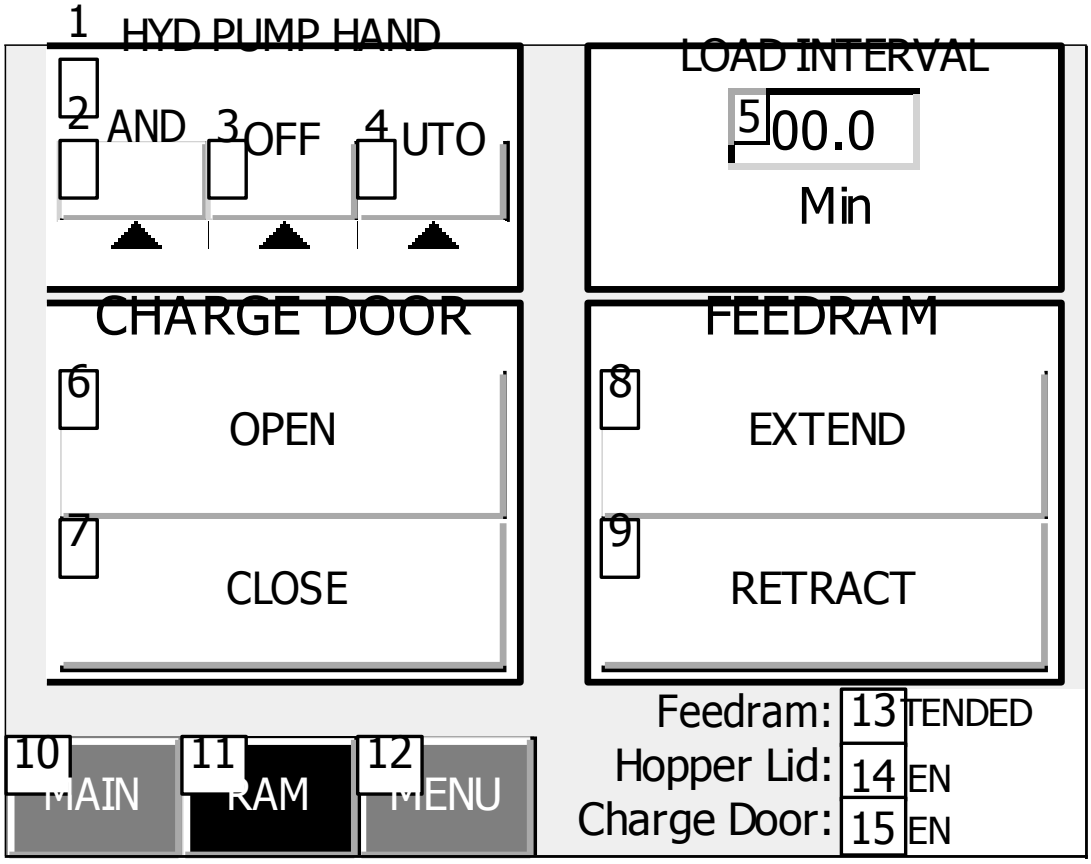
7.4.9. **LOAD INTERVAL TIME REMAINING**. Displays the time remaining until the next load cycle will begin.

7.4.10. **INCINERATOR START (STOP) BUTTON**. Use this button to start and stop the incinerator sequence of operation. When the button legend reads "**START INCINERATOR**", pressing the button will startup the incinerator. When the

button legend reads "**STOP INCINERATOR**", pressing the button will stop the incinerator.

## 7.5. RAM SCREEN

The RAM SCREEN contains the operator controls used to setup and actuate the feedram manually and provides for indication of actuator positions.




7.5.1. **HYD PUMP INDICATOR [1]**. Indicates which position the HAND-OFF-AUTO button array is set for.

7.5.2. **HYD PUMP HAND-OFF-AUTO [2,3,4]**. Three position, press-to-select type button array. Used to set the Hydraulic pump mode of operation. In the HAND position the hydraulic pump will energize and remain energized until it is turned off. In the OFF position the hydraulic pump is disabled. In the AUTO position the hydraulic pump will automatically energize and de-energize as required. Default position is AUTO. Note an arrow will appear under the mode button that has been selected.

7.5.3. **LOAD INTERVAL ENTRY [5]**. The load interval time controls the interval between load cycles. The minimum interval is 6.0 minutes and the maximum is 54.0 minutes. The load interval and load weights must be coordinated so that the incinerators burning capacity is not exceeded. In other words, the weight of each load cannot exceed the burning capacity multiplied by the decimal equivalent of the hourly load interval. For example, if the capacity of this incinerator is 600 lb/hr, and the load interval is set for 15 minutes, then the maximum weight for each load is calculated as: 600 x (15 / 60) = 150 lb.

Default for this setting is 15 minutes.

7.5.4. **CHARGE DOOR OPEN-CLOSE [6,7]**. When the OPEN button is pressed the charge door will open. When the CLOSE button is pressed the charge door will close. Releasing the buttons stops all charge door movement.

7.5.5. **FEEDRAM EXTEND-RETRACT [8,9]**. When the EXTEND button is pressed the Feedram will extend. When the RETRACT button is pressed the Feedram will retract. Releasing the buttons stops all Feedram movement.
*Note: The hopper lid must be closed, and the charge door must be fully open before the Feedram can be extended. The Feedram can be retracted from its mid-position with the charge door closed and the hopper lid open*.

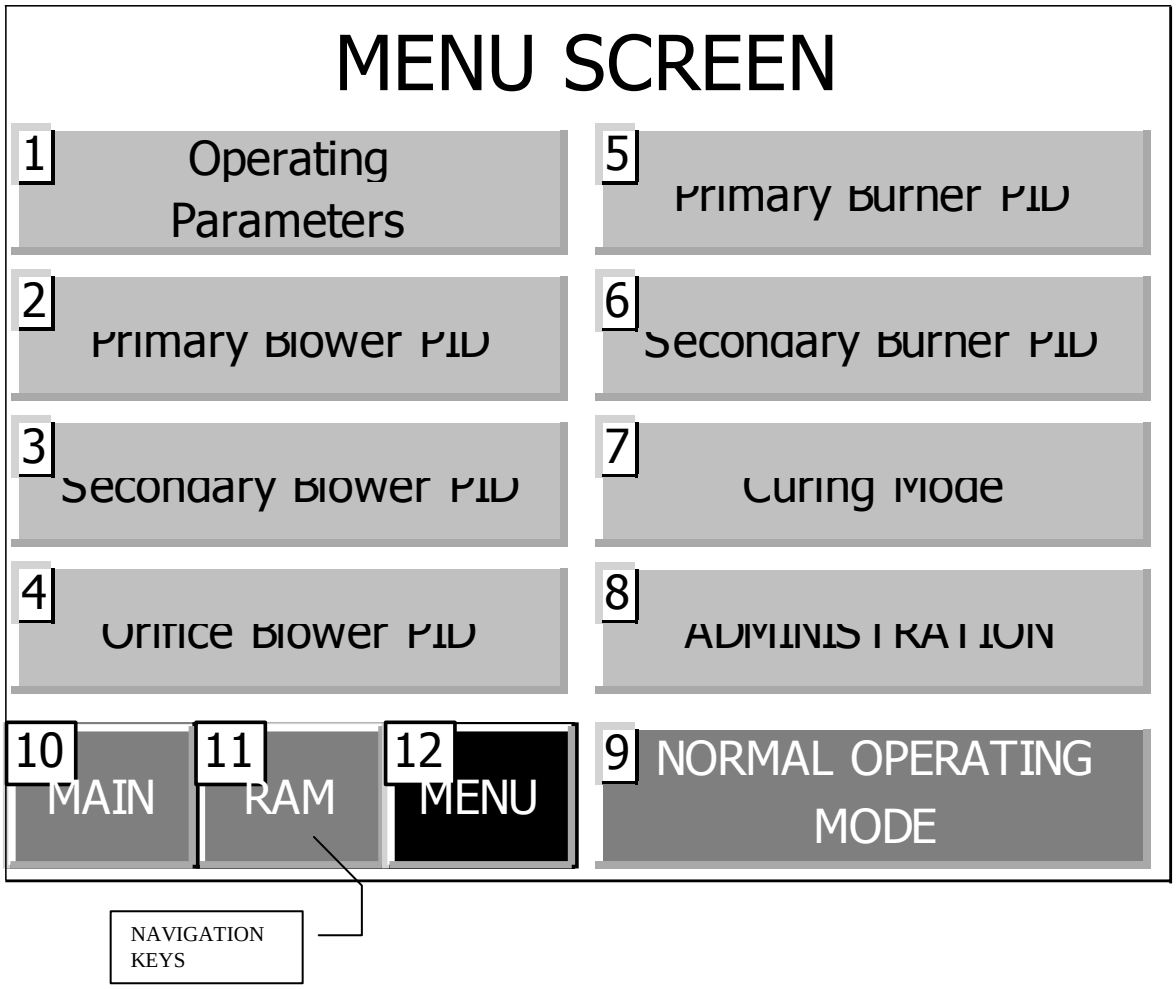
7.5.6. **POSITION INDICATORS [13,14,15]**. Indicates the position of the feedram, charge door and hopper lid relative to their "home" positions. The home positions for these devices are as follows.

Feedram: RETRACTED
Hopper Lid: CLOSED
Charge Door: CLOSED

If the feedram is not fully retracted then its indicator will read "EXTENDED", and likewise if the charge door and hopper lid are not closed, then their indicators will read "OPEN".

## 7.6. MAIN MENU SCREEN

The MAIN MENU SCREEN allows the operator to change the OPERATING MODE and allows for access to the various PARAMETER ENTRY and SETUP SCREENS. These screens may be password protected. If a screen is password protected the user will be prompted to enter a password.




7.6.1. **SCREEN SELECTION [1…8]**. The menu buttons function similarly to the navigation keys. When a menu key is pressed, its respective screen will be displayed. The menu buttons provide a means of going directly to a particular screen, or the beginning of a sequence of related screens. For example, pressing the OPERATING PARAMETERS button will cause the first screen of a series of related screens to be displayed.

7.6.2. **OPERATING MODE [9]**. This button toggles the incinerator operating mode between NORMAL and WASTE OIL ONLY modes of operation. Note the incinerator must be off to change modes.

7.6.2.1. **NORMAL OPERATING MODE** is used when burning primarily solid waste with the option of also burning waste oil.

7.6.2.2. **WASTE OIL ONLY OPERATING MODE** is used when burning only waste oil. In this mode the feedram is disabled preventing solid waste from being loaded into the incinerator. The primary chamber

must be empty of all combustible waste when operating in this mode.

## 7.7. CHANGING PARAMETERS

Parameters are changed by simply pressing on the object that displays the parameter data, and then entering new data using a popup keypad.

7.7.1. When a numeric entry object is pressed a *popup keypad* will be displayed.

7.7.2. The initial entry value will be the current setpoint value. Use the numeric keys to enter the new value. If the value needs to be negative, press the minus key [-] either before or after you enter the value. If you make a mistake, press the [BSP] (backspace) key to erase the last digit(s) entered. You can press the [ESC] (escape) key at any time to close the keypad without changing the parameter value. When you are finished entering a new value, press the [↵] (enter) key.

7.7.3. If the value you entered is outside a preset limit, it will be replaced by that parameter's default value. If the parameter is a temperature setting, the default value will be set in degrees Celsius (refer to the parameter settings table in section 1, paragraph 1.3, for the default values).

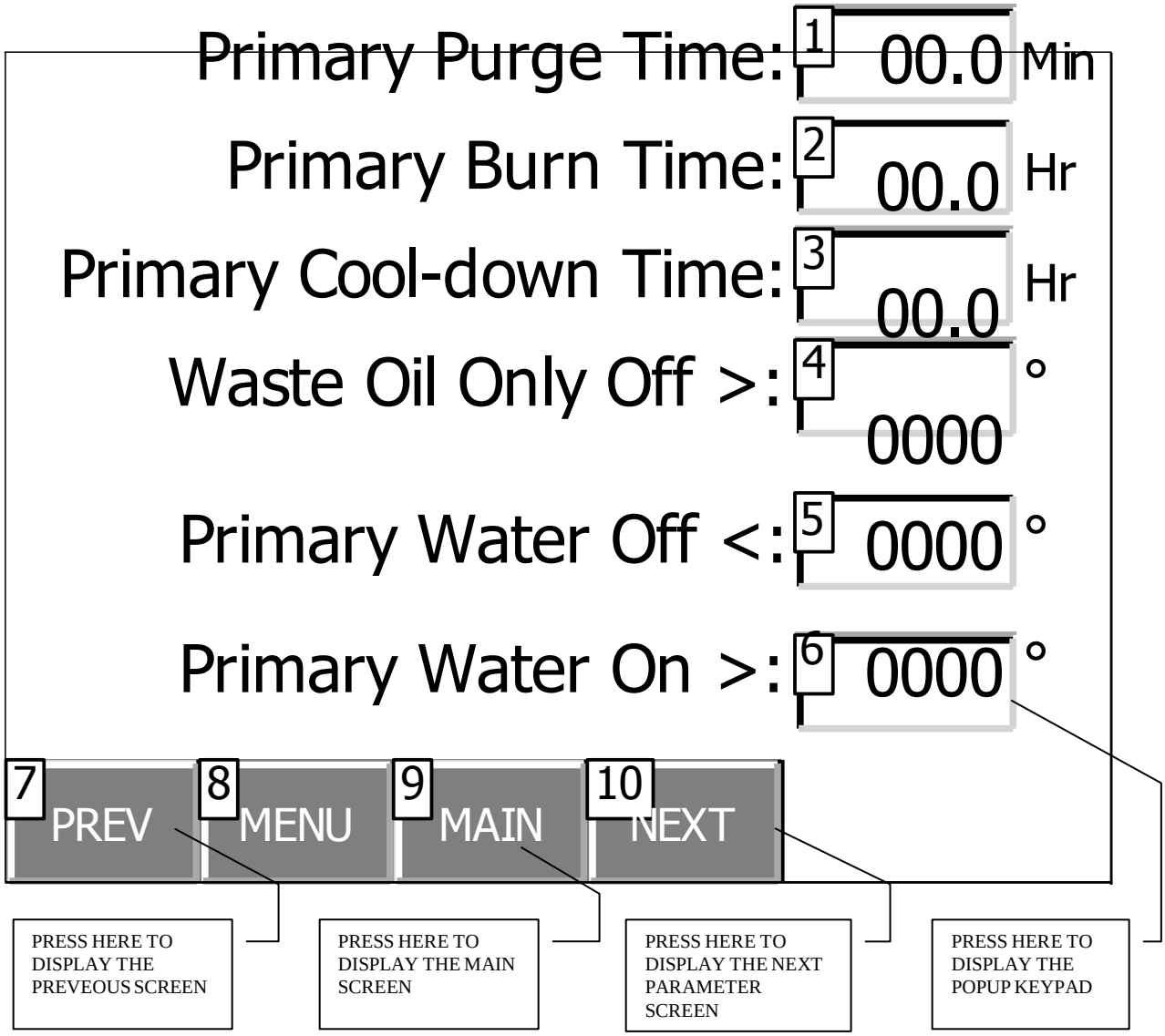
## 7.8. PARAMETER ENTRY SCREENS

The PARAMETER ENTRY SCREENS allow the user to view and/or change the incinerator cycle times, burner and blower temperature settings, and blower operating modes.

7.8.1. There are three screens for the primary chamber parameters, and one screen for the secondary chamber parameters. Primary screen 1 displays the primary cycle times. Primary screen 2 displays the primary burner temperature settings. Primary screen 3 displays the primary blower temperature settings and blower operating modes. The secondary screen displays all of the secondary chamber settings.

7.8.2. From the MENU SCREEN, press the [**OPERATING PARAMETERS**] button to display these screens in the order described above.

## 7.9. PRIMARY PARAMETERS - SCREEN 1




7.9.1. **PRIMARY PURGE TIME [1]**. Purge time sets the duration that the primary blower is energized before the warm-up cycle is started. This "purging" prevents an explosion from taking place if combustible gases are present in the chambers when the burners are energized.

7.9.2. **PRIMARY BURN TIME [2]**. Primary burn time sets the duration of the PRIMARY BURN CYCLE. This is the duration that the primary burner will be enabled to consume the waste in the primary chamber.

7.9.3. **PRIMARY COOL-DOWN TIME [3]**. Primary cool-down time sets the duration of the PRIMARY COOL-DOWN CYCLE. This is the duration that the primary blower is energized after the secondary burn cycle has completed. The cool-down cycle's function is to cool the primary chamber enough to enable the door to be opened for re-loading of waste or ash removal.

7.9.4. **WASTE OIL ONLY OFF [4]**. If the unit is operating in waste oil only mode, and the temperature in the primary chamber exceeds this setpoint, the waste oil

injection valves and primary burner #1 will de-energize, and remain de-energized, until the temperature in the primary chamber falls below the

## 7.9. PRIMARY PARAMETERS - SCREEN 1

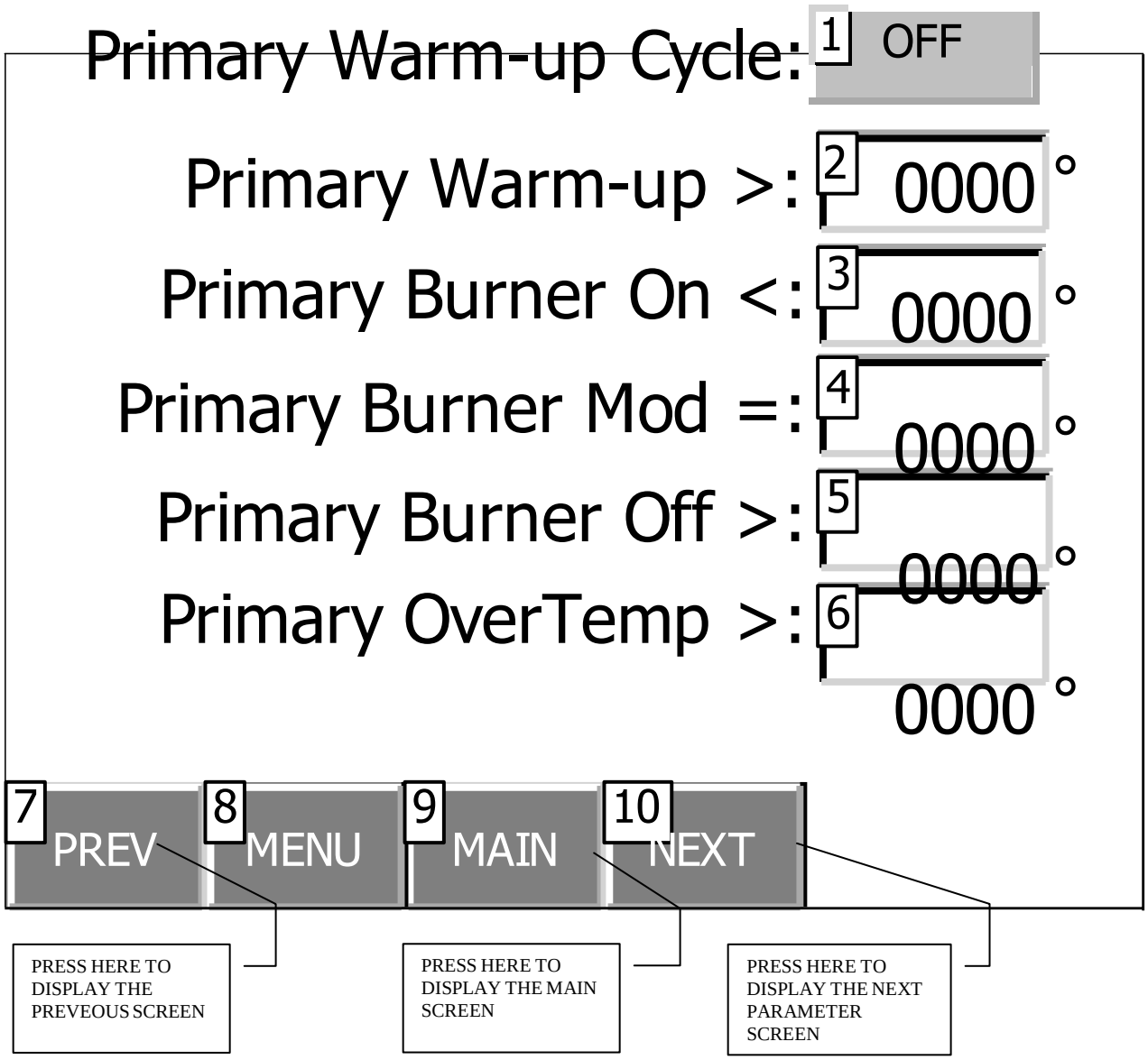
PRIMARY BURNER ON setpoint. This parameter prevents the primary chamber from getting too hot when running in waste only mode.

## 7.9 PRIMARY PARAMETERS - SCREEN 1

7.9.5. **PRIMARY WATER OFF [5]**. When the chamber temperature is below this setpoint the primary water spray system will be de-energized.

7.9.6. **PRIMARY WATER ON [6]**. If the chamber temperature exceeds this setpoint the primary water spray system will be energized. The water spray will remain on until the chamber temperature falls below the primary water off setpoint. Loading of waste will be inhibited when the chamber temperature exceeds this setpoint.

## 7.10. PRIMARY PARAMETERS - SCREEN 2




7.10.1. **PRIMARY WARM-UP CYCLE OFF-ON [1]**. Determines whether or not the primary burner should be turned on during the warm-up cycle. When set to the ON position, both the primary chamber and the secondary chamber temperatures must exceed their warm-up setpoint before the warm-up cycle can be completed. When set to the OFF position, only the secondary chamber needs to be above its warm-up temperature setting before waste can be incinerated. Normally used when very wet waste is to be incinerated.

7.10.2. **PRIMARY WARM-UP [2].** This is the temperature that the primary chamber must exceed for a period of one minute before the warm-up cycle can be completed if primary warm-up cycle is turned on**.**

## 7.10. PRIMARY PARAMETERS - SCREEN 2

7.10.3. **PRIMARY BURNER ON [3]**. If the burner is off, and the temperature in the chamber is below this setpoint, the primary burner will energize. Note the burner will de-energize only if the temperature in the chamber rises above the primary burner off setpoint. The burner on and off setpoints work in conjunction to prevent the chamber from getting too hot or too cool.

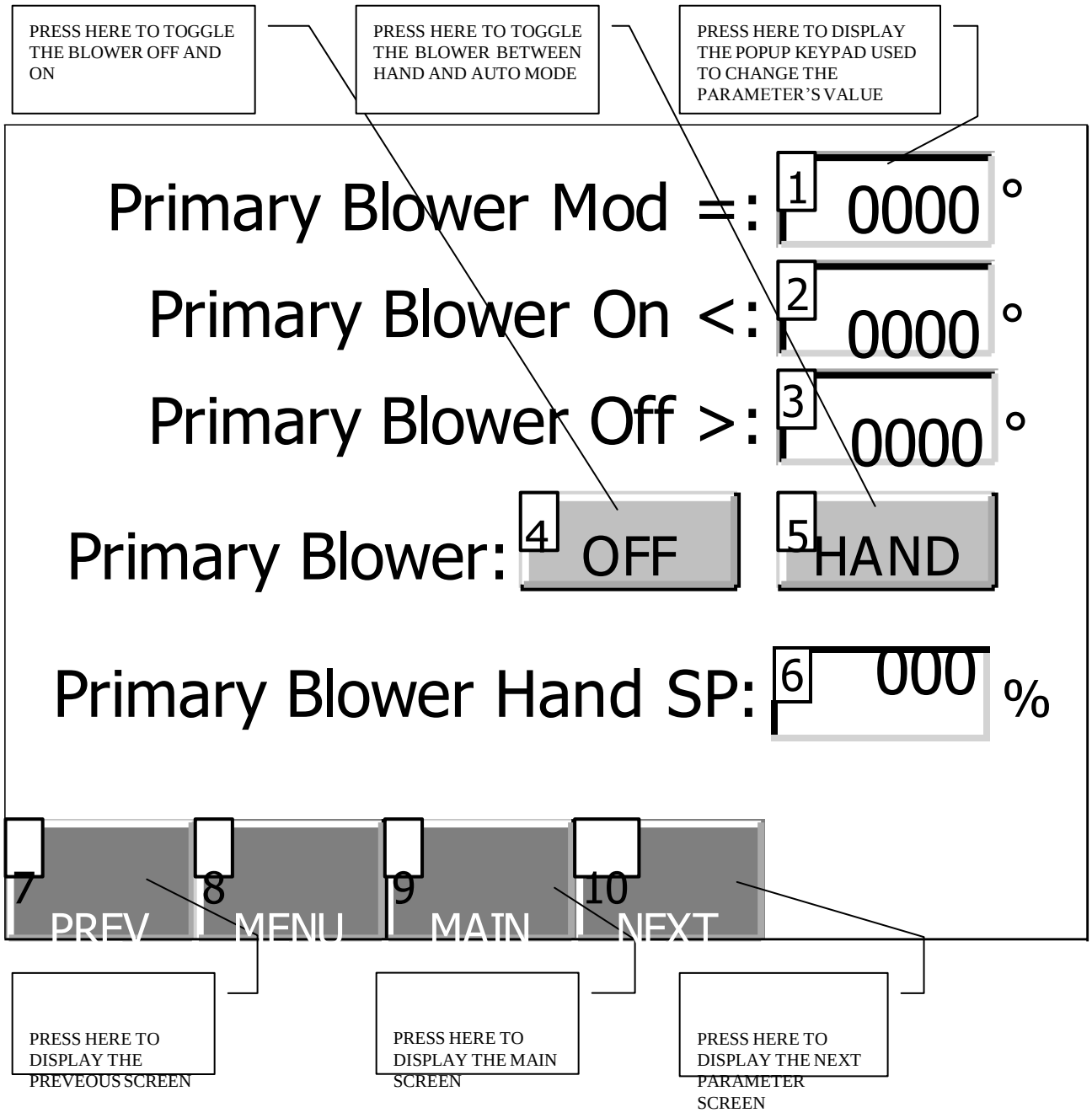
7.10.4. **PRIMARY BURNER MOD [4]**. If your unit is equipped with a modulating type burner, the firing rate of the burner will be modulated in an attempt to maintain this temperature setpoint. This parameter should be set greater than the burner-on setting, and less than the burner-off setting. Even if your unit is equipped with a simple off-on burner, keep this parameter set between the burner-on and burner-off setpoints.

7.10.5. **PRIMARY BURNER OFF [5]**. If the burner is on, and the temperature in the chamber rises above this setpoint, the primary burner will de-energize. Note the burner on and off setpoints work in conjunction to prevent the chamber from getting too hot or too cool.

7.10.6. **PRIMARY OVERTEMP [6]**. If the temperature in the chamber rises above this setpoint the PRIMARY OVER TEMPERATURE ALARM will be displayed. If your unit is equipped with the optional alarm light, it will illuminate in a flashing on and off state until the temperature falls below this setpoint.

## 7.11. PRIMARY PARAMETERS - SCREEN 3

SCREEN 3 allows the user to view and/or change the PRIMARY BLOWER TEMPERATURES and BLOWER OPERATING MODES.




7.11.1. **PRIMARY BLOWER MOD [1]**. If your unit is equipped with a modulating type blower, the speed of the blower will be modulated in an attempt to maintain this temperature setpoint. This parameter should be 50° higher than the PRIMARY BURNER MOD setpoint. Also, this parameter should be set less than the blower-on setting. Even if you unit is equipped with a constant speed blower, keep this parameter set less than the blown-on setpoint.

7.11.2. **PRIMARY BLOWER ON [2]**. If the blower is off, and the temperature in the chamber falls below this setpoint, the blower will energize. Note the blower

on and off setpoints work in conjunction to prevent the chamber from getting too hot or too cool.

## 7.11. PRIMARY PARAMETERS - SCREEN 3

7.11.3. **PRIMARY BLOWER OFF [3]**. If the blower is on, and the temperature in the chamber rises above this setpoint, the blower will de-energize. Note the blower on and off setpoints work in conjunction to prevent the chamber from getting too hot or too cool.

7.11.4. **PRIMARY BLOWER ON-OFF [4]**. Pressing this button toggles the primary blower between its ON and OFF states.

7.11.4.1. **OFF**. When the button displays "OFF" the blower is disabled and will not operate during the normal burn cycle.

7.11.4.2. **ON**. When the button displays "ON" the blower is enabled and will function in the normal burn cycle according to the blower mode button.

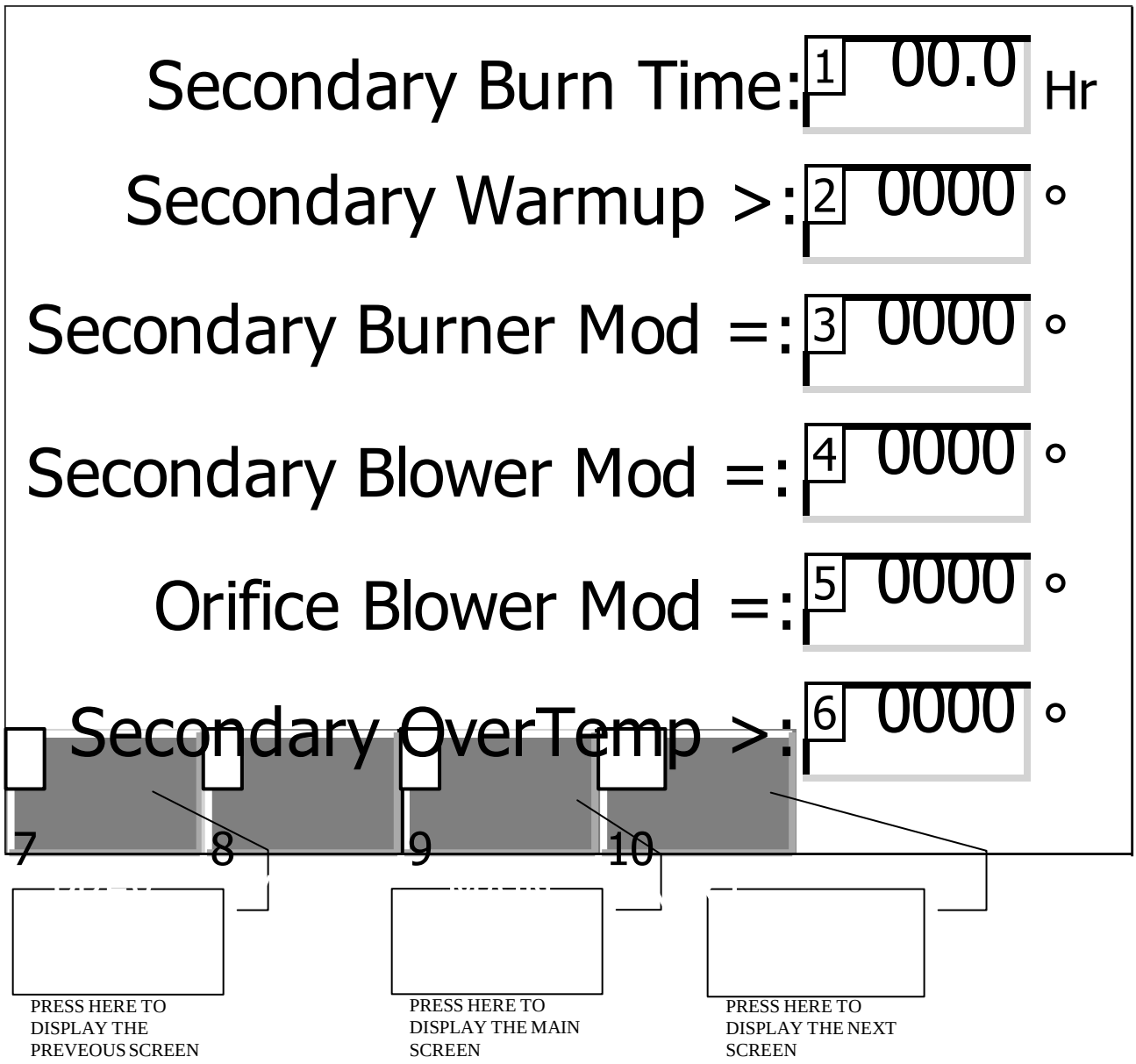
7.11.5. **PRIMARY BLOWER HAND-AUTO [5]**. Pressing this button toggles the primary blower between its HAND and AUTO modes.

7.11.5.1. **HAND.** When the button displays "HAND" the blower will run at a constant speed during the normal burn cycle. The blower-off setpoint is disregarded, and only the primary over-temperature alarm will disable the blower. If your unit is equipped with a modulating blower, it will run at the PRIMARY BLOWER HAND speed setpoint.

7.11.5.2. **AUTO.** When the button displays "AUTO" the blower is enabled and will turn on and off - speed up and slow down - as required to maintain a constant temperature in the primary chamber. If the chamber temperature is below the PRIMARY BLOWER OFF setpoint the blower is energized. If the chamber rises above the PRIMARY BLOWER OFF setpoint the blower is de-energized and will remain de-energized until the temperature falls below the PRIMARY BLOWER ON setpoint. If your unit is equipped with a modulating blower, its speed will be modulated in an attempt to maintain the chamber temperature at the PRIMARY BLOWER MOD setpoint.

7.11.6. **PRIMARY BLOWER HAND SP [6]**. If your unit is equipped with a modulating blower, this setpoint controls the speed of the blower when it is in the HAND mode. Note this setpoint cannot be set less than the MIN CV setpoint that is programmed into the blower PID parameter screen. See paragraph 7.13.6 for details on the MIN CV parameter.

## 7.12. SECONDARY PARAMETERS SCREEN




7.12.1. **SECONDARY BURN TIME [1]**. Secondary burn time sets the duration of the SECONDARY BURN CYCLE. This is the duration that the secondary burners and blower will remain energized to consume the smoke produced by any smoldering ashes in the primary chamber.

7.12.2. **SECONDARY WARM-UP [2]**. This is the temperature that the secondary chamber must exceed to complete the secondary warm-up cycle. The secondary chamber temperature must exceed this setpoint for one minute before the primary burn cycle will be started. The function of the warm-up cycle is to ensure the secondary chamber is hot enough to completely combust the flammable gasses and particulates emitted from the primary chamber.

7.12.3. **SECONDARY BURNER MOD [3]**. The secondary burner will be modulated between its low and high-fire settings to maintain this temperature setting. If

your unit is equipped with a fully modulating type burner, the firing rate of the burner will be infinitely modulated in an attempt to maintain this temperature setpoint, otherwise it will be modulated between a fixed low and

high-fire setting. This parameter must be set greater than the secondary warm-up setting, and less than the secondary blower mod setting.

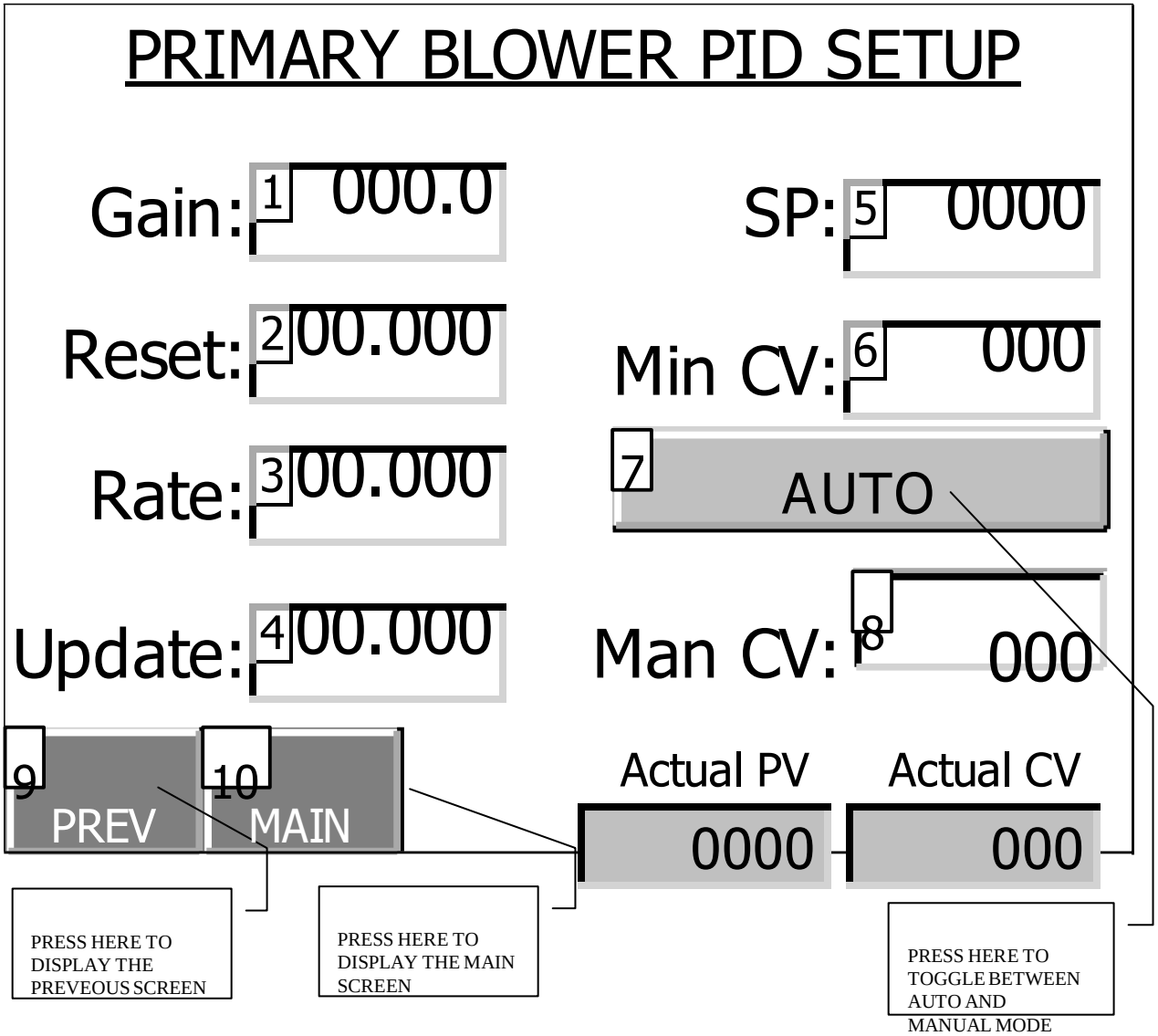
7.12.4. **SECONDARY BLOWER MOD [4]**. If your unit is equipped with a modulating type blower, the speed of the blower will be modulated in an attempt to maintain this temperature setpoint. This parameter must be set slightly higher than the secondary burner mod setpoint.

7.12.5. **SECONDARY OVERTEMP [5]**. If the temperature in the chamber rises above this setpoint the SECONDARY OVER TEMPERATURE ALARM will be displayed. If your unit is equipped with the optional alarm light, it will illuminate in a flashing on and off state until the temperature falls below this setpoint. The feedram, primary burners and primary blower will be disabled until the secondary chamber temperature falls below this setpoint.

## 7.13. PID TUNING SCREEN

The PID TUNING SCREEN allows the user to tune the PID loops associated with their respective devices. The tuning screens are only applicable if their respective devices have been installed on the unit. In other words, if your unit has been installed with the optional modulating blowers, then the blower PID tuning screens are applicable to your incinerator. If your unit does not have the optional modulating blowers, then these screens have no control over the fixed speed blowers installed on your unit.

Because all the PID tuning screens are identical in layout and function, only one screen will be examined in detail.




7.13.1. **GAIN [1]**. This sets the gain for the loop. Valid entry values are between 0.1 and 100.0. If the gain is positive, the loops is "reverse acting", the control value (CV) will decrease as the process value (PV) increases. If the gain is negative, the loops is "direct acting", the control value will increase as the process value increases. ***Note that only the secondary blower and orifice blower are "direct acting", and must have negative gain values***. The default value varies for each loop as follows:

7.13.1.1. Primary Blower Gain: 5.0

7.13.1.2. Secondary Blower Gain: -10.0

7.13.1.3. Orifice Blower Gain: -10.0

7.13.1.4. Primary Burner Gain: 5.0

7.13.1.5. Secondary Burner Gain: 5.0

7.13.2. **RESET [2]**. This sets the *reset time* (integral) for the loop. Valid entry values are between 0.001 and 10.000. Default value is 0.100.

7.13.3. **RATE [3]**. This sets the *rate time* (derivative) for the loop. Valid entry values are between 0.001 and 10.000. Default value is 0.010.

7.13.4. **UPDATE [4]**. This sets the loop *update time* in seconds. Valid entry values are between 0.001 and 10.000. Default value is 0.50.

7.13.5. **SP [5]**. This is the loop *setpoint* (SP). Valid entry values are between 0 and 2300. Default values are the "MOD" setpoints (see paragraph 1.3).

7.13.6. **MIN CV [6]**. This is the *minimum control value* (CV) that the loop will output. Valid entry values are between 0 and 100%. The default value for the primary blower is 25% and 15% for the secondary blower. The default value for the burner loops are 0%.

7.13.7. **AUTO-MANUAL [7]**. This button toggles the loop between *auto* and *manual* mode. When the loop is in auto mode, the CV is controlled by the PID loop equation. When the loop is in manual mode, the CV is controlled by the MAN CV setpoint. This feature is used to setup the burner low and high fire settings, and for adjusting the blower VFD maximum frequency setting for full load current draw on the motor.

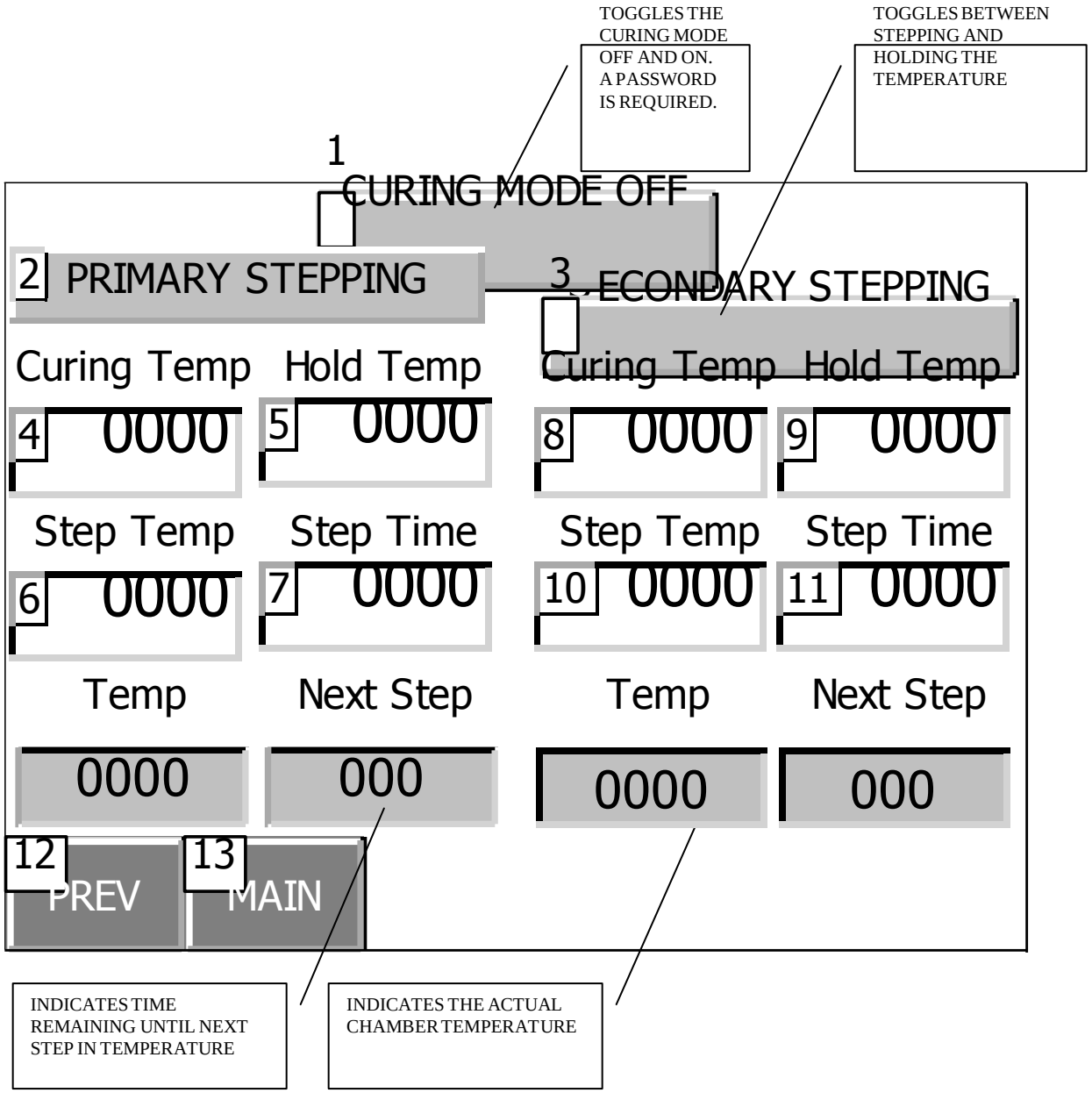
7.13.8. **MAN CV [8]**. This setpoint is used when the loop is in manual mode. The ACTUAL CV will follow this value. Valid ranges are from MIN CV to 100%.

7.13.9. **ACTUAL PV**. This is the actual *process variable* in degrees.

7.13.10. **ACTUAL CV**. This is the actual *control value* being output to the loop, ranging between 0% and 100% (4 to 20mA or 0 to 10vdc).

## 7.14. CURING SCREEN

The CURING SCREEN is a special function screen used when commissioning the incinerator, or when refractory repairs have been made and need to be cured. Note the initial curing of the refractory must be done in the exact sequence as described in the Curing Instructions Heat-up Schedule (ACS form #743) before the incinerator will be allowed to start. The PLC monitors the curing process, and only after the curing process has been executed properly will the PLC allow the incinerator to start.




7.14.1. **CURING MODE ON-OFF [1].** This button toggles the curing mode on and off. The incinerator must be off to start the curing mode. Note the curing mode is retentive, so it will "remember" its state during a power outage, so when power is restored, the curing cycle will recommence from where it left off.

7.14.2. **PRIMARY STEPPING-HOLDING [2].** This button toggles the primary chamber curing mode between stepping the primary temperature and holding the

primary temperature. When the button reads "holding", the temperature will be maintained at the CURING TEMP setpoint.

7.14.3. **SECONDARY STEPPING-HOLDING [3]**. This button toggles the secondary chamber curing mode between stepping the secondary temperature and holding the secondary temperature. When the button reads "holding", the temperature will be maintained at the CURING TEMP setpoint.

7.14.4. **CURING TEMP [4 & 8]**. This is the temperature that the burners will maintain during the curing cycle. The burners will de-energize when the temperature exceeds this setpoint, and will energize when the temperature falls below this setpoint.

7.14.5. **HOLD TEMP [5 & 9]**. When the CURING TEMP setpoint equals, or exceeds, this setpoint, stepping of the CURE TEMP setpoint stops and the chamber is held at the CURE TEMP setpoint.

7.14.6. **STEP TEMP [6 & 10]**. This is the step value that will be added to the CURE TEMP setpoint at the step time interval. For example, if the STEP TEMP is 50, and the STEP TIME is 30, the value 50 will be added to the CURE TEMP setpoint every 30 minutes.

7.14.7. **STEP TIME [7 & 11]**. This is the time interval between curing temperature steps, or the interval between adding the STEP TEMP setpoint to the CURE TEMP setpoint.

7.14.8. **TEMP**. This is the actual chamber temperature.

7.14.9. **NEXT STEP**. This is the time, in minutes, remaining until the next step in temperature occurs.

7.14.10. **CURING MODE EXAMPLE**

7.14.10.1. CURING TEMP at 50°C (100°F).
HOLD TEMP at 175°C (350°F).
STEP TEMP at 25°C (50°F).
STEP TIME at 60 minutes.

7.14.10.2. Toggle STEP/HOLD to STEPPING

7.14.10.3. Toggle the CURING MODE to ON.

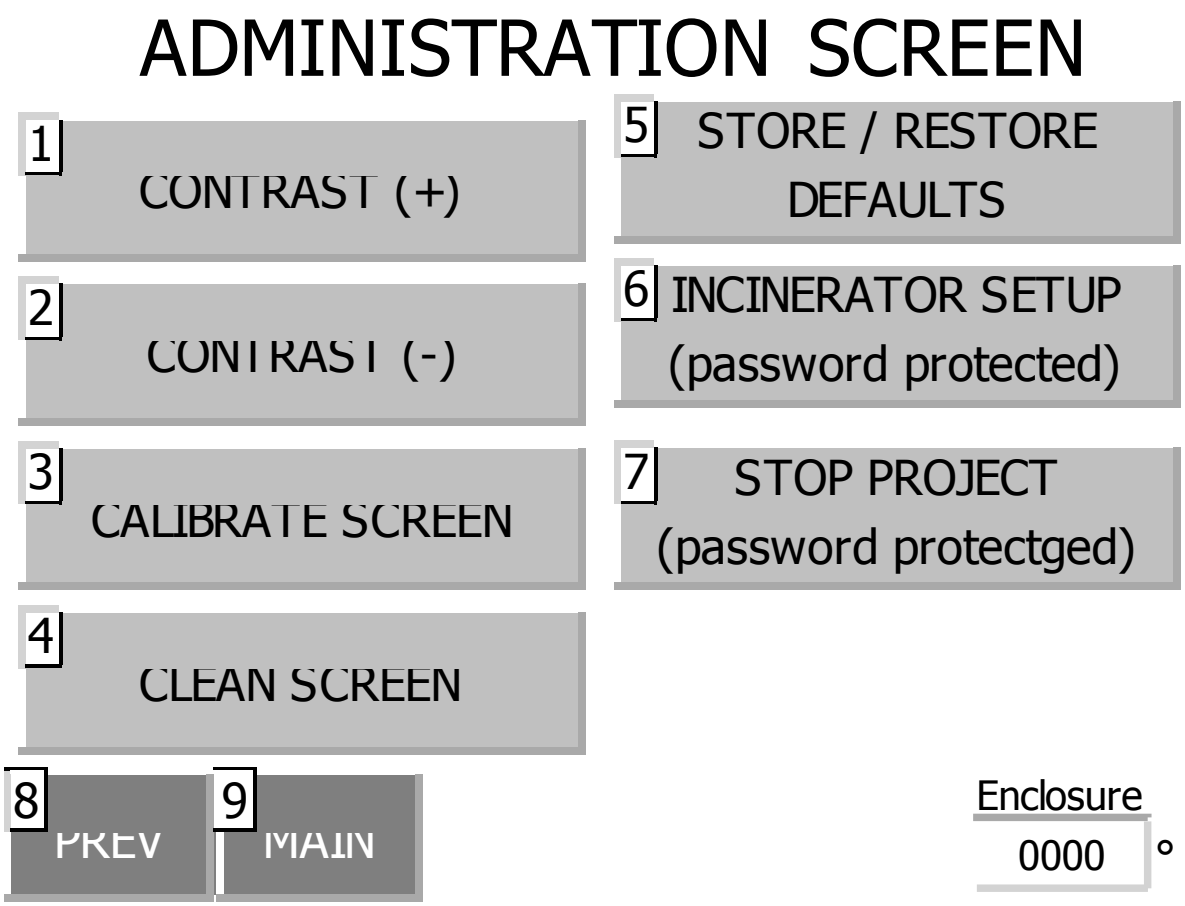
7.14.10.4. WHEN THE CURING MODE IS SET TO ON THE BURNERS WILL IGNITE AND RUN UNTIL THE CHAMBER TEMPERATURE REACHES THE CURING TEMP SETPOINT. THE BURNERS WILL CYCLE OFF AND ON AT THIS TEMPERATURE SETTING UNTIL THE STEP TIME INTERVAL EXPIRES. WHEN THE STEP TIME INTERVAL EXPIRES, THE STEP TEMP SETPOINT WILL BE ADDED TO THE CURING TEMP SETPOINT. THE BURNERS WILL NOW CYCLE OFF AND ON AT THE NEW CURING TEMP SETPOINT. THIS ALGORITHM WILL CONTINUE UNTIL THE CURING TEMP SETPOINT EQUALS THE HOLD TEMP SETPOINT, AT WHICH TIME THE CYCLE WILL AUTOMATICALLY SWITCH FROM STEPPING TO HOLDING. THE BURNERS WILL CONTINUE TO CYCLE OFF AND ON AT THE CURING TEMP SETPOINT

UNTIL NEW CURING TEMP AND HOLD TEMP SETTINGS HAVE BEEN ENTERED AND THE STEP/HOLD TOGGLED BACK TO STEPPING.

7.14.10.5. TO SLOWLY COOL THE CHAMBER AFTER THE HIGHEST CURING TEMPERATURE HAS BEEN REACHED, SET THE STEP TEMP SETPOINT TO A **NEGATIVE** VALUE AND SET THE CURING TEMP SETPOINT 50°C (100°F) LESS THAN THE HOLD TEMP SETPOINT. TOGGLE STEP/HOLD TO STEPPING. THE CURING TEMP SETPOINT WILL BE DECREMENTED AT THE STEP TIME INTERVAL UNTIL ITS VALUE IS LESS THAN 50°C (100°F). NOTE THE BURNERS WILL CONTINUE TO CYCLE ON AND OFF (AT SOME TEMPERATURE BELOW 50°C) UNTIL THE CURING MODE IS TURNED OFF.

## 7.15. ADMINISTRATION SCREEN

The ADMINISTRATION SCREEN is a special function screen that allows for adjusting the screen contrast and for calibrating the "touch" coordinates. It also allows you to clean the touch screen by deactivating the buttons for a short period of time. The RESTORE DEFAULT SETPOINTS button will access another screen where all the factory default values can be restored. The HMI SETUP and STOP PROJECT buttons are for factory use. They are password protected and should not be activated by the user unless directed to do so by a factory technician. The enclosure temperature is also indicated on this screen.




7.15.1. **CONTRAST (+) [1]**. Each time this button is pressed the screen contract will be increased (made darker).

7.15.2. **CONTRAST (-) [2]**. Each time this button is pressed the screen contract will be decreased (made lighter).

7.15.3. **CALIBRATE SCREEN [3]**. When this button is pressed a calibration screen will appear with instruction on how to calibrate the touch screen. You will need a stylus (do not use a ball point pen or pencil) to calibrate the screen. Just follow the on-screen directions when they appear.

7.15.4. **CLEAN SCREEN [4]**. This button de-actives the touch screen for 30 seconds to allow time to clean the screen.

7.15.5. **STORE / RESTORE DEFAULTS [5]**. This button displays the default setpoint screen where all the parameters can be *restored from* the factory default

settings, or where the current settings can be *saved as* the factory default settings.

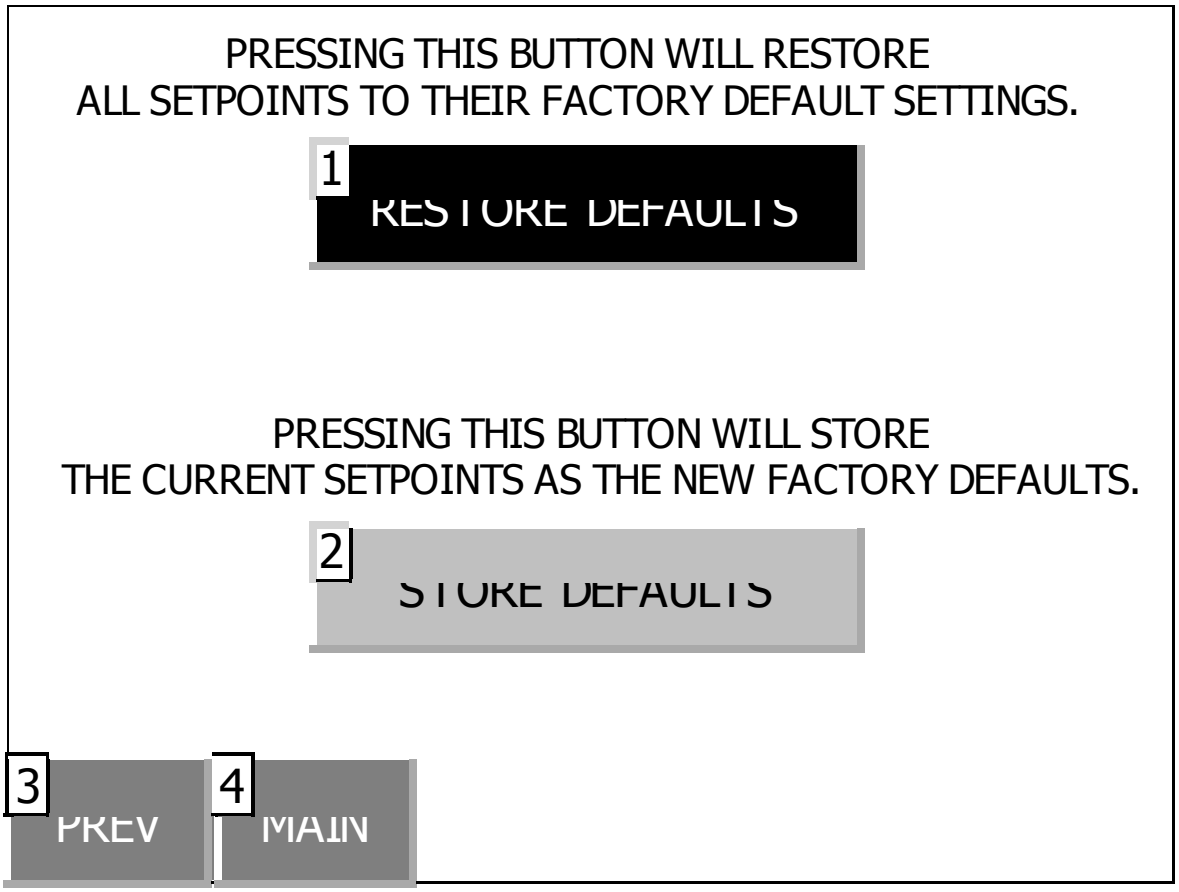
7.15.6. **INCINERATOR SETUP [6]**. This button displays factory setup screens where the options for modulating blowers, modulating burners, and units of temperature measurement are selected. This setup screen also enables or disables selected burner alarms. This button is password protected.

7.15.7. **STOP PROJECT [7]**. This button is used to stop the project to allow for downloading of a new program. This button is password protected.

7.15.8. **ENCLOSRE TEMPERATURE**. This displays the internal temperature of the control enclosure. The electronic components within the enclosure are rated for a maximum of 50°C (120°F). If this reading is in excess of 50°C (120°F), steps must be taken to decrease the temperature or premature failure of the components will occur.

## 7.16. RESTORE DEFAULT SETTINGS SCREEN

The RESTORE DEFAULT SETTINGS SCREEN allows for restoring the factory default settings for all parameters, including the PID parameters, or for saving the current parameters as the factory default settings.



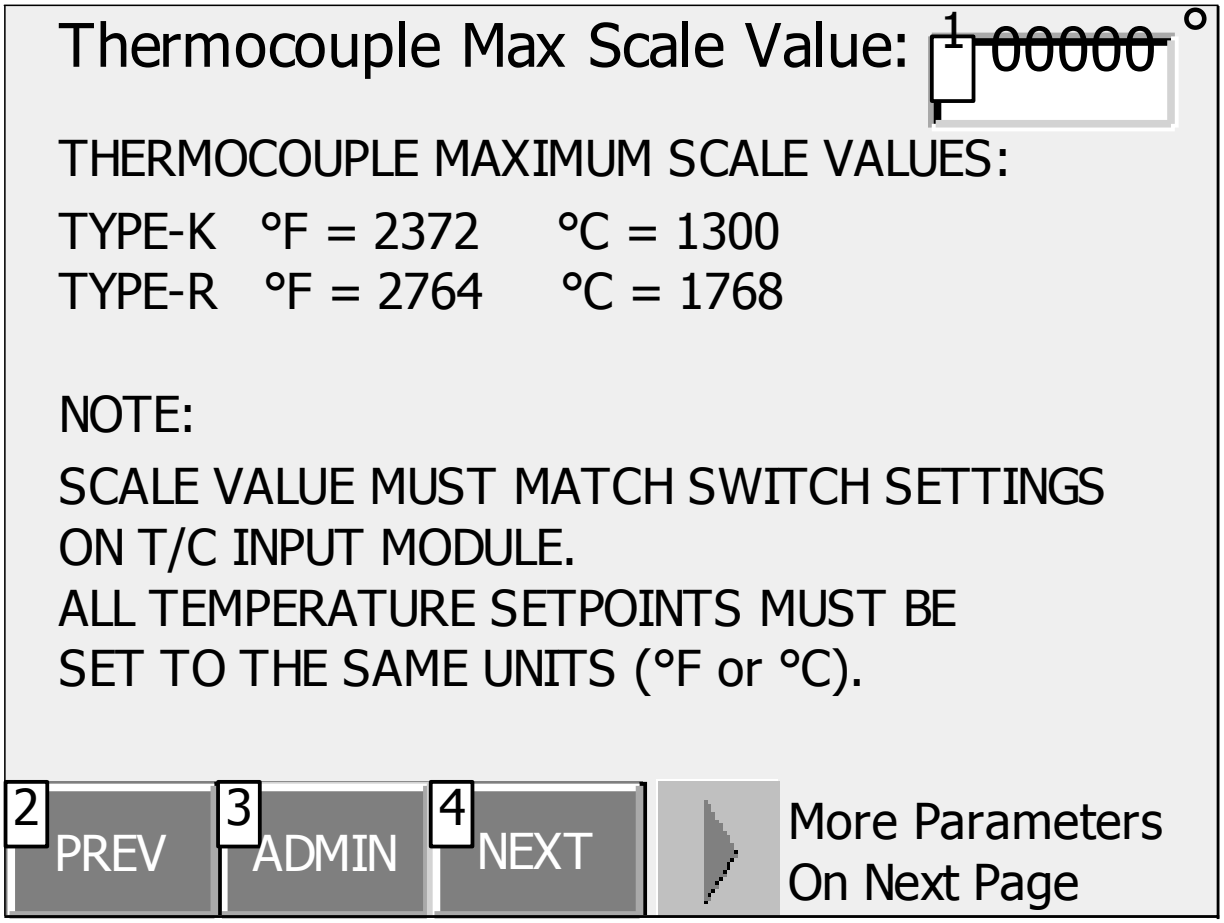

7.16.1. **RESTORE DEFAULTS [1]**. Pressing this button will restore all of the factory default settings. When the settings have been restored, the administration screen will automatically be displayed.

7.16.2. **STORE DEFAULTS [2]**. Pressing this button will store all of the current settings as the factory default settings. When the settings have been stored, the administration screen will automatically be displayed

7.16.3. **NAVIGATION KEYS**. To exit this screen without restoring the settings, press either the PREV or MAIN navigation key.

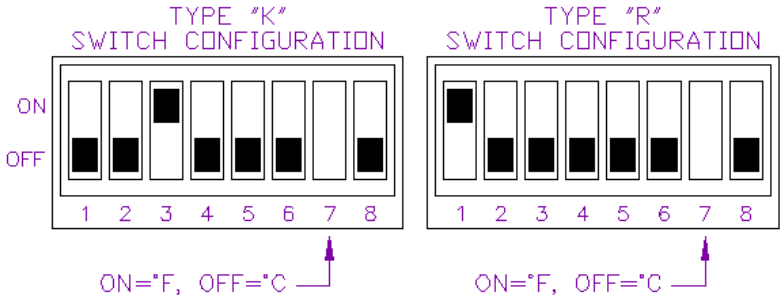
## 7.17. INCINERATOR SETUP SCREENS

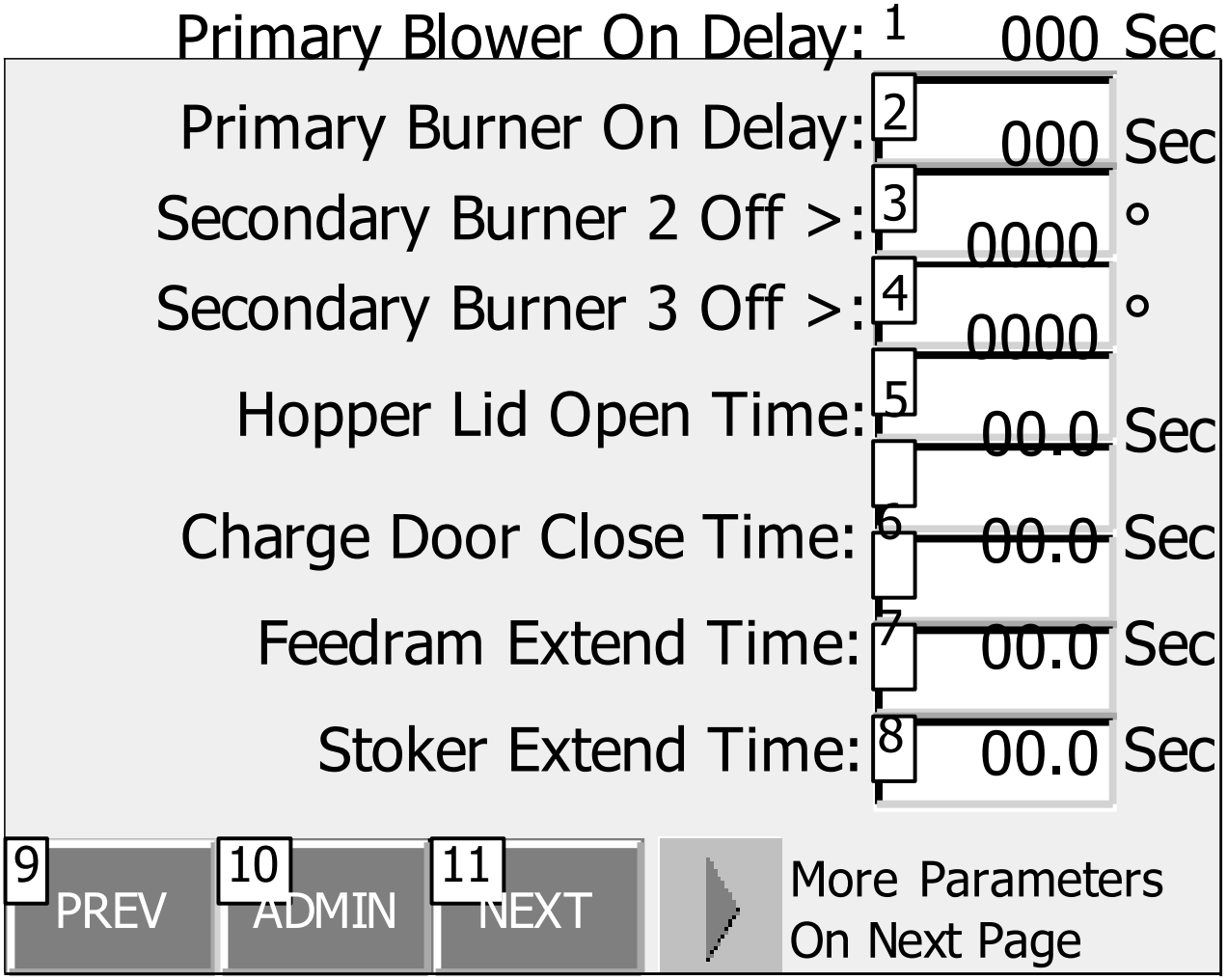
The INCINERATOR SETUP SCREENS are used by factory technicians during the commissioning of the incinerator electrical control system. Once set, these parameters normally never need to be changed.




7.17.1. **THERMOCOUPLE MAX SCALE VALUE [1].** This is the maximum scaled value returned by the thermocouple input module for the type and units of measurement that the module has been setup for. Note that all of the temperature setpoints must be set to the same units of measurement (°C or °F).

*Thermocouple Input Module Setup Switch Configurations*






7.17.2. **PRIMARY BLOWER ON DELAY [1]**. The amount of time that must elapse from the end of a load cycle until the primary blower is allowed to re-energize.

7.17.3. **PRIMARY BURNER ON DELAY [2]**. The amount of time that must elapse from the end of a load cycle until the primary burner is allowed to re-energize.

7.17.4. **SECONDARY BURNER #2 OFF [3]**. When the Secondary Temperature exceeds this setpoint the #2 burner flame is extinguished (the burner fan continues to run).

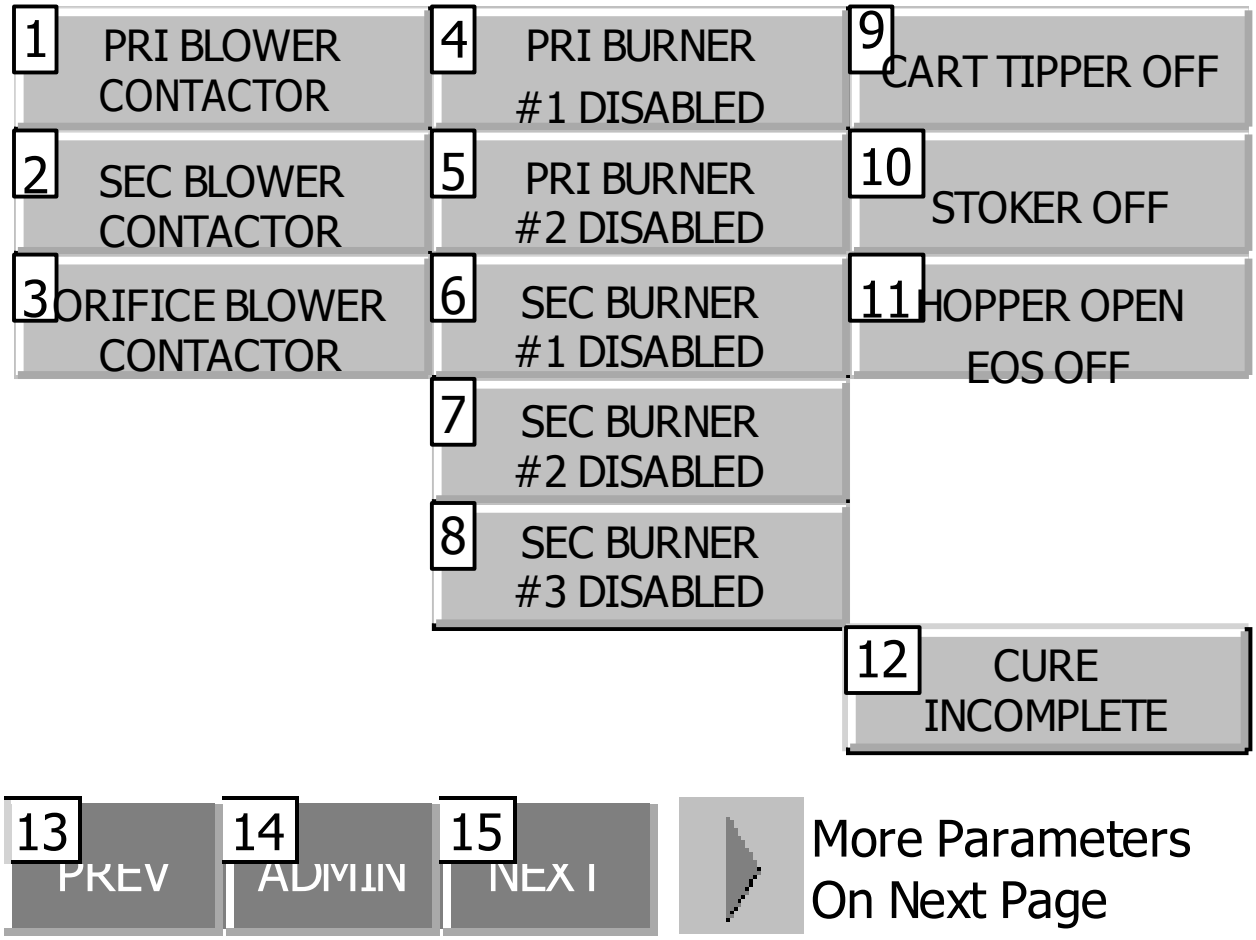
7.17.5. **SECONDARY BURNER #3 OFF [4]**. When the Secondary Temperature exceeds this setpoint the #3 burner flame is extinguished (the burner fan continues to run).

7.17.6. **HOPPER LID OPEN TIME [5]**. This is the amount of time that is required for the hopper lid to open at the end of the loading sequence.

7.17.7. **CHARGE DOOR CLOSE TIME [6]**. This is the amount of time that is required for the charge door to close.

7.17.8. **FEEDRAM EXTEND TIME [7]**. This is the amount of time it takes the Feedram to travel from the mid-position limit switch to the end of its stroke.

7.17.9. **STOKER EXTEND TIME [8]**. This is the amount of time that the stoker is extended before a load cycle is initiated.




7.17.10. **BLOWER CONTACTOR-VFD [1…3]**. Selects between the standard contactor motor starter and the optional Variable Frequency Drive (VFD) for the selected blower.

7.17.11. **BURNER ENABLE-DISABLE [4…8]**. Enables or disables the alarm for the selected burner.

7.17.12. **CART TIPPER ON-OFF [9]**. Enables or disables the logic for the cart tipper.

7.17.13. **STOKER ON-OFF [10]**. Enables or disables the logic for the stoker.

7.17.14. **HOPPER OPEN EOS ON-OFF [11]**. Selects weather or not the hopper lid opens at the end of the loading sequence.

7.17.15. **CURE INCOMPLETE/COMPLETE [12]**. This button will set or reset the curing complete flag within the PLC. The incinerator will not operate until the curing cycle has been completed. This button must read “cure complete” before the incinerator will operate normally.

ACS INC.

ADVANCED COMBUSTION SYSTEMS
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*Divisions of ACS, INC.*

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# CURING INSTRUCTIONS: PAGE 1

**NOTE:** *ACS, Inc. will not be responsible for any damage to the refractory lining should it occur during the curing process and furthermore, ACS warranty of refractory linings is only valid if the curing process is performed by an ACS technician.*

*The incinerator will not operate in normal waste incineration mode until the curing cycle has been completed.* CURING MODE *is initiated by navigating away from the* MAIN SCREEN, *to the* MENU SCREEN, *and on to* CURING MODE. *The curing cycle is considered complete when the primary chamber temperature has reached at least 1200°F while the secondary chamber temperature has simultaneously reached at least 1600°F. If the below curing instructions are carefully followed, good curing results can be achieved. If there are any questions, contact ACS prior to curing. See* ***Heat-up Schedule*** *below for specific heat up times and hold points.*

Castable installations should be thoroughly heat dried and fired before being placed into service. Castable linings require a carefully controlled heat-up schedule to prevent spalling and this is especially true with castables using high purity, high strength binders. Since these products are hydraulically activated, there will be residual water remaining after air drying both as mechanical or free-water and chemically combined water of hydration.

Heat will remove free-water by evaporation or as steam at 212°F (100°C) and will remove the chemically combined water of hydration between 400°F (204°C) and 1200°F (649°C). A hold in temperature should be used in the above noted ranges to allow the moisture to move out of the lining. If steaming is observed at any point during the curing, the temperature should be held at that point until all steaming has stopped. Direct flame impingement on the refractory must be avoided to prevent localized hot spotting and/or spalling. The preferred heating rate is normally a temperature rise of 50° to 100°F per hour up to the holding period for removal of the chemically combined water of hydration and then is increased to a rate of 100°F per hour thereafter. For best results it is normally suggested that the initial heat-up be carried to a point of approximately 100°F above service temperature. That temperature will give optimum strength and service life to the refractory lining. Once the heat up has begun, it should not be interrupted but should be carried out to completion before using or cooling the incinerator.

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# CURING INSTRUCTIONS: PAGE 2

**NOTE:** When water/steam is seen coming from the refractory or out of the seams of the main body, (typically seen at 600°F to 800°F and at 1200°F to 1500°F), the temperature should be held until it stops. The normal hold time is between 6 and 8 hours. It is imperative that the curing process does not continue until all signs of water/steam have ceased. Failure to do so may cause refractory damage.

Continue curing until temperatures in both primary and secondary chambers have maximized, or 1600°F in the primary chamber and 2000°F in the secondary.

**Heat-up Schedule**

| | 3" – 6" |
|---|---|
| **Ambient Cure Duration** | 24 hrs |
| **Ambient to 350°F Rate** | 50°F/hr |
| **350°F HOLD Duration** | ½ hr/in |
| **350°F to 850°F Rate** | 75°F/hr |
| **850°F HOLD Duration** | ½ hr/in |
| **850°F to 1150°F Rate** | 75°F/hr |
| **1150°F HOLD Duration** | 5 hrs |
| **1150°F to OPERATING TEMP. Rate** | 75°F/hr |
| **OPERATING TEMP. HOLD Duration** | 5 hrs |

***IMPORTANT NOTE*:** If excessive pressurized steaming is observed during any part of these schedules, discontinue heat up. Hold current temperature until steaming subsides, then resume the schedule. The temperatures shown above and the rates of increase are based on refractory hot face temperatures as read from properly placed heat sensing devices. Use at your own risk. *Warning: May cause steam spalling and explosive conditions.*

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# INSPECTION & MAINTENANCE SCHEDULE: PAGE 1

**NOTE:** *This schedule encompasses all the incineration equipment that **ACS** manufactures. If your unit is not equipped with a particular piece of equipment, ignore that section.*

***ACS*** incineration equipment is built to last with minimal maintenance. Reasonable care and periodic checks of key components will insure sound operation, efficient combustion, minimal maintenance down time, and long equipment life. As a rule, always keep the area around the incinerator, feedram loader, and ash removal system free of debris. When loading waste or removing ash, always use good housekeeping practices.

## INCINERATOR:

By **ACS**'s definition, the "*incinerator*" includes the primary and secondary combustion chambers, stack system, combustion air blowers and manifolds, and auxiliary fuel burners and fuel trains. Following is a breakdown of these items:

**1. PRIMARY AND SECONDARY CHAMBERS:**

a. **Steel Casing:**

i. Weekly: Inspect for degradation caused by rusting or "*hot spots*". Hot spots usually indicate a loss of refractory material in that section of the chamber. Refer to the refractory section.

**Note:** Areas around burner ports and chamber orifices may slightly discolor as part of normal operation.

ii. Quarterly: Remove surface rust and touch-up paint areas as required. Areas rusted beyond repair should be patched with steel plate.

b. **Refractory Lining:** Refractory life will be extended by avoiding abusive cleaning, charging obvious non-combustibles (large metallic objects), and exposure to water when hot.

i. Monthly: Inspect refractory lining for excessive wear or cracking. Refractory cracking is normal and expected after initial curing, however, cracks exceeding 1/4" wide through refractory lining should be repaired. Repairs can be made with plastic "*poundable*" refractory or similar material. Reference recommended spare parts list.

ii. Annually: Make any major lining repairs with castable refractory or firebrick. Consult ACS or a reputable refractory installer if assistance is needed.

**1. PRIMARY AND SECONDARY CHAMBERS:** (continued)

c. **Air Ports:** Clean air ports are essential to maintain optimum combustion.

- i. Weekly: Clean the primary chamber air ports. Loosen and pull back the air channels, "*rod*" out each of the pipes. Stubborn clogs may be freed by the use of a rotahammer with a masonry bit
- ii. Quarterly: Clean orifice and secondary chamber air ports. Use of a small scraping tool and a shop vac usually eases this task. On some secondary chambers the ports may be rodded similar to the primary chamber air ports. Clean secondary chamber of all accumulated fly ash. Use care not to damage refractory lining.

d. **Charging, Cleanout, and Inspection Doors:**

- i. Weekly: Inspect refractory and gasket condition. Refer to refractory lining discussion above for such problems. The gasket must make an air tight seal between the door and chamber to maintain a "*controlled air*" condition in the incinerator.
- ii. Monthly: Adjust door gasket as required. Lubricate door hinge bearings. Clean observation port glass. Inspect limit switch for proper operation and adjustment.
- iii. Annually Replace door gaskets and observation port glass as required.

e. **Hinge Bearing Assembly:**

- i. Weekly: Visually inspect equipment operation.
- ii. Monthly: Lubricate bearings as necessary.
- iii. Annually: Adjust and service bearings as necessary.

**2. STACK SYSTEM:**

a. **Steel Casing:**

- i. Monthly: Inspect for degradation caused by rusting or "*hot spots*".
- ii. Annually: Remove surface rust and touch-up paint areas as required. Areas rusted beyond repair should be patched with steel plate.

b. **Refractory Lining:**

- i. Quarterly: Inspect refractory lining for excessive wear or cracking. Refractory cracking is normal and expected after initial curing, however, cracks exceeding 1/4" wide through refractory lining should be repaired. Repairs can be made with plastic "*poundable*" refractory or similar material.
- ii. Annually: Make any major lining repairs with castable refractory or firebrick. Consult ACS or a reputable refractory installer if assistance is needed.

c. **Spark Arrestor:**

- i. Monthly: Visually inspect screen material for signs of burn-out.
- ii. Annually: Replace screen material as required. Burn-out is expected as the screen material is an expendable item.

# INSPECTION & MAINTENANCE SCHEDULE: PAGE 3

**3. COMBUSTION AIR SYSTEM:**

a. **Blowers:**

| | | |
|---|---|---|
| i. | Daily: | Visually inspect equipment operation. |
| ii. | Weekly: | Clean air intakes of accumulated debris. |
| iii. | Monthly: | Inspect impeller assemblies for balance, tightness, and material buildup. Make repairs or adjustments as necessary. |
| iv. | Annually: | Inspect all electrical conduits and conductors for condition and proper connection. |

b. **Air Modulation Systems:**

| | | |
|---|---|---|
| i. | Daily: | Visually inspect equipment operation. |
| ii. | Weekly: | Check proper operation relative to temperature controller setpoint. |
| iii. | Monthly: | Inspect damper and linkage for correct adjustment and attachment. Make repairs as necessary. |
| iv. | Annually: | Recalibrate motor action to temperature controller. Reference both motor and controller literature in manual. |

c. **Air Manifolds:**

| | | |
|---|---|---|
| i. | Weekly: | Clean primary air channels and air manifold flex tubes of accumulated debris. |
| ii. | Quarterly: | Clean primary, orifice, and secondary air manifolds of accumulated debris. |

**4. AUXILIARY FUEL SYSTEM:**

a. **Burners:**

| | | |
|---|---|---|
| i. | Daily: | Visually inspect equipment operation. |
| ii. | Weekly: | Clean air intakes of accumulated debris. |
| iii. | Monthly: | Inspect and clean spark electrodes and flame sensors. Reference burner literature in manual for proper gap setting. |
| iv. | Annually: | Replace electrodes and flame sensor. Test flame relay for proper operation per manufactures instructions. Check fuel to air ratio and adjust as necessary. Check fuel oil pump outputs and adjust as necessary. Inspect all electrical conduits and conductors for condition and proper connection. |

b. **Controls:**

| | | |
|---|---|---|
| i. | Quarterly: | Check all valves for proper operation. Replace oil filter elements. |
| ii. | Annually: | Check line pressure and adjust to specifications in burner manual. Check all lines for leaks and make repairs as necessary. Inspect all electrical conduits and conductors for condition and proper connection. |

# FEEDRAM LOADER:

The "*feedram loader*" includes the feedram, hopper lid, guillotine door, cart tipper, hydraulic cylinders, hydraulic power unit, limit switches and feedram water spray system. Following is a breakdown of these items:

**1. FEEDRAM:**

a. **Steel Trough:**

| | | |
|---|---|---|
| i. | Daily: | Visually inspect for accumulated debris, including the area behind the ram rear access door, remove as necessary. |
| ii. | Monthly: | Inspect for degradation caused by rusting or mechanical abrasion. |
| iii. | Quarterly: | Remove surface rust and touch-up paint areas as required. |
| iii. | Annually: | Replace gasket at rear access door. |

b. **Ram Box:**

| | | |
|---|---|---|
| i. | Daily: | Visually inspect ram face for accumulated debris, remove as necessary. |
| ii. | Monthly: | Inspect for degradation caused by rusting or mechanical abrasion. Make repairs as necessary. |

c. **Cam Roller Guide System:**

| | | |
|---|---|---|
| i. | Daily: | Visually inspect equipment operation. |
| ii. | Monthly: | Lubricate cam rollers as necessary. |
| iii. | Annually: | Adjust cam rollers as necessary for proper ram movement. |

**2. HOPPER LID:**

a. **Steel Casing:**

| | | |
|---|---|---|
| i. | Daily: | Visually inspect for accumulated debris, remove as necessary. |
| ii. | Monthly: | Inspect for degradation caused by rusting. |
| iii. | Annually: | Remove surface rust and touch-up paint areas as required. |

b. **Hinge Assembly:**

| | | |
|---|---|---|
| i. | Daily: | Visually inspect for proper operation. |
| ii. | Monthly: | Inspect for degradation caused by rusting or mechanical wear. |
| iii. | Annually: | Repair or replace as necessary. |

c. **Gasket Material:**

| | | |
|---|---|---|
| i. | Weekly: | Visually inspect for proper sealing. |
| ii. | Annually: | Replace as necessary. |

# INSPECTION & MAINTENANCE SCHEDULE: PAGE 5

**3. GUILLOTINE DOOR:**

a. **Steel Casing:**

- i. Daily: Visually inspect for accumulated debris, remove as necessary.
- ii. Monthly: Inspect for degradation caused by rusting or "*hot spots*".
- iii. Annually: Remove surface rust and touch-up paint areas as required.

b. **Refractory Lining:**

- i. Quarterly: Inspect refractory lining for excessive wear or cracking. Refractory cracking is normal and expected after initial curing, however, cracks exceeding 1/4" wide should be repaired. Repairs can be made with plastic "*poundable*" refractory or similar material.
- ii. Annually: Make any major lining repairs with castable refractory or firebrick. Consult ACS or a reputable refractory installer if assistance is needed.

c. **Chain Drive System:**

- i. Daily: Visually inspect equipment operation.
- ii. Monthly: Lubricate bearings and chain assembly.
- iii. Annually: Adjust bearings and/or chain assembly as necessary.

**4. CART TIPPER:**

a. **Steel Frame:**

- i. Daily: Visually inspect for accumulated debris, remove as necessary.
- ii. Monthly: Inspect for degradation caused by rusting or mechanical wear.
- iii. Quarterly: Remove surface rust and touch-up paint areas as required.

b. **Waste Chute Work:**

- i. Daily: Visually inspect for accumulated debris, remove as necessary.
- ii. Monthly: Inspect for degradation caused by rusting or mechanical wear.
- iii. Quarterly: Remove surface rust and touch-up paint areas as required.

c. **Hinge Bearing Assembly:**

- i. Daily: Visually inspect equipment operation.
- ii. Monthly: Lubricate bearings as necessary.
- iii. Annually: Adjust and service bearings as necessary.

d. **Waste Carts:**

- i. Daily: Visually inspect for excess accumulated debris, remove as necessary.
- ii. Monthly: Inspect for degradation caused by rusting or mechanical wear. Make repairs as necessary.
- iii. Quarterly: Remove surface rust and touch-up paint areas as required. Lubricate castor wheel bearings.

# INSPECTION & MAINTENANCE SCHEDULE: PAGE 6

**5. HYDRAULIC CYLINDERS:**

a. **Feedram:**

| | | |
|---|---|---|
| i. | Weekly: | Inspect lines, hoses, fittings, and cylinder rod seals for leaks, make repairs as necessary. |
| ii. | Quarterly: | Inspect rod eye and clevis for proper alignment and attachment. Lubricate and adjust carriage assembly wheels as necessary. |
| iii. | Annually: | Replace rod seals as required. |

b. **Hopper Lid:**

| | | |
|---|---|---|
| i. | Weekly: | Inspect lines, hoses, fittings, and cylinder rod seals for leaks, make repairs as necessary. |
| ii. | Quarterly: | Inspect rod eye and clevis for proper alignment and attachment. |
| iii. | Annually: | Replace rod seals as required. |

c. **Guillotine Door:**

| | | |
|---|---|---|
| i. | Weekly: | Inspect lines, hoses, fittings, and cylinder rod seals for leaks, make repairs as necessary. |
| ii. | Quarterly: | Inspect rod eye for proper alignment and attachment to chain assembly. |
| iii. | Annually: | Replace rod seals as required. |

d. **Cart Tipper:**

| | | |
|---|---|---|
| i. | Weekly: | Inspect lines, hoses, fittings, and cylinder rod seals for leaks, make repairs as necessary. |
| ii. | Quarterly: | Inspect trunion mount and spherical rod end for proper alignment and attachment. Lubricate spherical rod end. |
| iii. | Annually: | Replace rod seals as required. |

**6. HYDRAULIC POWER UNIT:**

a. **Fluid:**

| | | |
|---|---|---|
| i. | Daily: | Check fluid level, add as required. |
| ii. | Bi-annually: | Remove and replace hydraulic fluid as required. |

b. **Filter:**

| | | |
|---|---|---|
| i. | Quarterly: | Remove and replace hydraulic filter as required. |

c. **Pump:**

| | | |
|---|---|---|
| i. | Daily: | Inspect for fluid leaks, make repairs as required. Listen for cavatation or bearing noises, take appropriate action. Reference pump literature in manual. |
| ii. | Annually: | Check pump pressure and flow output, adjust as required. Inspect electrical conduit and conductors to motor for condition and connection. |

d. **Solenoid Valves:**

| | | |
|---|---|---|
| i. | Daily: | Inspect for fluid leaks, make repairs as required. |
| ii. | Annually: | Check valves for proper operation and fluid flow to cylinders, adjust as required. |

# INSPECTION & MAINTENANCE SCHEDULE: PAGE 7

**7. LIMIT SWITCHES:**

a. **Charge Door:**
- i. Weekly: Inspect limit switch for proper operation.
- ii. Quarterly: Inspect limit switch with incinerator off to check limit switch for proper adjustment. Inspect electrical conduit and conductors for condition and connection.

b. **Feedram:**
- i. Weekly: Inspect "*home*" and "*midpoint*" limit switches for proper operation.
- ii. Quarterly: Run feedram in manual mode with incinerator off to check limit switches for proper adjustment. Inspect electrical conduit and conductors for condition and connection.

c. **Hopper Lid:**
- i. Weekly: Inspect "*closed*" and "*open*" limit switches for proper operation.
- ii. Quarterly: Run hopper lid in manual mode with incinerator off to check limit switches for proper adjustment. Inspect electrical conduit and conductors for condition and connection.

d. **Guillotine Door:**
- i. Weekly: Inspect "*closed*" and "*open*" limit switches for proper operation.
- ii. Quarterly: Run guillotine door in manual mode with incinerator off to check limit switches for proper adjustment. Inspect electrical conduit and conductors for condition and connection.

e. **Cart Tipper:**
- i. Weekly: Inspect "*down*" limit switch for proper operation.
- ii. Quarterly: Run tipper in manual mode with incinerator off to check limit switches for proper adjustment. Inspect electrical conduit and conductors for condition and connection.

**8. FEEDRAM WATER SPRAY SYSTEM:**

a. Nozzles:
- i. Weekly: Inspect nozzle flow and spray pattern for signs of plugging, remove and clean as necessary. Adjust manual control valve if required.

b. Solenoid Valves:
- i. Monthly: Inspect valves for proper operation.
- ii. Annually: Inspect all electrical conduits and conductors for condition and connection.

c. Lines, hoses, and Fittings:
- i. Monthly: Inspect for leaks, make repairs as necessary.

d. Flame Sensor and Control Relay:
- i. Monthly: With incinerator off, check for proper operation of fire suppression system. Reference sensor and relay literature in manual.

# ASH REMOVAL SYSTEM:

The "*ash removal system*" includes the ash stoker ram, ash door, ash chute, ash carts, hydraulic cylinders, limit switches, and water spray system. Following is a breakdown of these items:

**1. ASH STOKER RAM:**

a. **Steel Casing:**

- i. Daily: Visually inspect for accumulated debris, remove as necessary.
- ii. Monthly: Inspect for degradation caused by rusting or "*hot spots*".
- iii. Quarterly: Remove surface rust and touch-up paint areas as required.

b. **Refractory Head:**

- i. Monthly: Inspect refractory lining for excessive wear or cracking.
- ii. Annually: Replace head if required, this is expected as it is considered an expendable item.

c. **V-Groove Roller Guide System:**

- i. Daily: Visually inspect equipment operation.
- ii. Monthly: Lubricate rollers as necessary.
- iii. Annually: Adjust rollers as necessary for proper ram movement.

d. **Gasket Material:**

- i. Weekly: Visually inspect for proper sealing.
- ii. Annually: Replace as necessary.

**2. ASH DOOR:**

a. **Steel Casing:**

- i. Daily: Visually inspect for accumulated debris, remove as necessary.
- ii. Monthly: Inspect for degradation caused by rusting or "*hot spots*".
- iii. Quarterly: Remove surface rust and touch-up paint areas as required.

b. **Refractory:**

- i. Quarterly: Inspect refractory lining for excessive wear or cracking. Refractory cracking is normal and expected after initial curing, however, cracks exceeding 1/4" wide should be repaired. Repairs can be made with plastic "*poundable*" refractory or similar material.
- ii. Annually: Make any major lining repairs with castable refractory or firebrick. Consult ACS or a reputable refractory installer if assistance is needed.

# INSPECTION & MAINTENANCE SCHEDULE: PAGE 9

**2. ASH DOOR:** (continued)

c. **V-Groove Roller Guide System:**

- i. Daily: Visually inspect equipment operation.
- ii. Monthly: Lubricate rollers as necessary.
- iii. Annually: Adjust rollers as necessary for proper door movement.

d. **Gasket Material:**

- i. Weekly: Visually inspect for proper sealing.
- ii. Annually: Replace as necessary.

**3. ASH CHUTE:**

a. **Steel Frame:**

- i. Weekly: Visually inspect for accumulated debris, remove as necessary.
- ii. Monthly: Inspect for degradation caused by rusting or mechanical wear.
- iii. Quarterly: Remove surface rust and touch-up paint areas as required.

b. **Hinge Bearing Assembly:**

- i. Weekly: Visually inspect equipment operation.
- ii. Monthly: Lubricate bearings as necessary.
- iii. Annually: Adjust and service bearings as necessary.

**4. ASH CARTS:**

a. **Steel Shell:**

- i. Daily: Visually inspect for excess accumulated debris, remove as necessary.
- ii. Monthly: Inspect for degradation caused by rusting or mechanical wear. Make repairs as necessary.
- iii. Quarterly: Remove surface rust and touch-up paint areas as required.

b. **Castors:**

- i. Quarterly: Lubricate castor wheel bearings.

**5. HYDRAULIC CYLINDERS:**

a. **Ash Stoker Ram:**

- i. Weekly: Inspect lines, hoses, fittings, and cylinder rod seals for leaks, make repairs as necessary.
- ii. Quarterly: Inspect trunion mount and spherical rod end for proper alignment and attachment. Lubricate spherical rod end.
- iii. Annually: Replace rod seals as required.

# INSPECTION & MAINTENANCE SCHEDULE: PAGE 10

**5. HYDRAULIC CYLINDERS:** (continued)

b. **Ash Door:**

| | | |
|---|---|---|
| i. | Weekly: | Inspect lines, hoses, fittings, and cylinder rod seals for leaks, make repairs as necessary. |
| ii. | Quarterly: | Inspect trunion mount and spherical rod end for proper alignment and attachment. Lubricate spherical rod end. |
| iii. | Annually: | Replace rod seals as required. |

**6. LIMIT SWITCHES:**

a. **Ash Stoker Ram:**

| | | |
|---|---|---|
| i. | Weekly: | Inspect "*home*" and "*midpoint*" limit switches for proper operation. |
| ii. | Quarterly: | Run ash ram in manual mode with incinerator off to check limit switches for proper adjustment. Inspect electrical conduit and conductors for condition and connection. |

b. **Ash Stoker Ram:**

| | | |
|---|---|---|
| i. | Weekly: | Inspect "*closed*" and "*open*" limit switches for proper operation. |
| ii. | Quarterly: | Run ash door in manual mode with incinerator off to check limit switches for proper adjustment. Inspect electrical conduit and conductors for condition and connection. |

**7. WATER SPRAY SYSTEM:**

a. **Nozzles:**

| | | |
|---|---|---|
| i. | Weekly: | Inspect nozzle flow and spray pattern for signs of plugging, remove and clean as necessary. Adjust manual control valve if required. |

b. **Solenoid Valves:**

| | | |
|---|---|---|
| i. | Monthly: | Inspect valves for proper operation. |
| ii. | Annually: | Inspect all electrical conduits and conductors for condition and connection. |

c. **Lines, hoses, and Fittings:**

| | | |
|---|---|---|
| i. | Monthly: | Inspect for leaks, make repairs as necessary. |

# AUTOMATIC CONTROL SYSTEM:

**1. CONTROL PANEL ENCLOSURE:**

a. **Steel Shell:**

- i. Monthly: Inspect for degradation caused by rusting. Inspect door gaskets for signs of leaking, make repairs as necessary.
- ii. Quarterly: Remove surface rust and touch-up paint areas as required.

b. **Interior:**

- i. Monthly: Inspect for moisture from condensation or leaking from exterior. Add vapor inhibitors and/or make repairs as necessary.
- ii. Quarterly: Inspect for corrosion on all contacts, terminals, and conductors. Cleanup or make repairs as required.
- **Note:** If moisture continues to be apparent, an environmental control system should be installed in the enclosure.

c. **Conduit & Connections:**

- i. Quarterly: Inspect all electrical conduits and conductors for condition and connection.

**2. PROGRAMMABLE LOGIC CONTROLLER:**

a. **Power Supply:**

- i. Weekly: Visually inspect equipment operation.
- ii. Quarterly: Check operation per manufactures specifications. Reference literature in manual. Inspect electrical conductors for condition and connection.

b. **Processing Unit:**

- i. Weekly: Visually inspect equipment operation.
- ii. Quarterly: Check operation per manufactures specifications. Reference literature in manual. Inspect electrical conductors for condition and connection.

c. **Input/Output Modules:**

- i. Weekly: Visually inspect equipment operation.
- ii. Quarterly: Check operation per manufactures specifications. Reference literature in manual. Inspect electrical conductors for condition and connection.

d. **User Interface:**

- i. Daily: Visually inspect equipment operation.
- ii. Quarterly: Check timer and counter settings per **ACS** recommendations. Check operation per manufactures specifications. Reference literature in manual. Inspect electrical conductors for condition and connection.

# INSPECTION & MAINTENANCE SCHEDULE: PAGE 12

**3. TEMPERATURE CONTROLS:**

a. **Controller:**

i. Daily: Visually inspect equipment operation.

ii. Quarterly: Check set points and programming per **ACS** recommendations. Check operation per manufactures specifications. Reference literature in manual. Inspect electrical conductors for condition and connection.

b. **Sensor:**

i. Quarterly: Check condition of sensor element and protection tube.

ii. Annually:: Replace unit as required.

**4. MOTOR STARTING CONTROLS:**

a. **Contactors:**

i. Weekly: Visually inspect equipment operation.

ii. Quarterly: Inspect contacts for signs of corrosion or burning.

b. **Overload Relays:**

i. Quarterly: Test operation with push-button on unit. Inspect electrical conductors for condition and connection.

c. **Protection Fuses:**

i. Quarterly: Inspect for signs of corrosion or burning. Check resistance of each. Inspect electrical conductors for condition and connection.

**5. PILOT LIGHT & SELECTOR SWITCH ASSEMBLIES:**

a. **Pilot Lights:**

i. Daily: Visually inspect equipment operation.

ii. Quarterly: Check proper operation of each unit. Replace bulbs as required. Inspect electrical conductors for condition and connection.

b. **Selector Switches:**

i. Daily: Visually inspect equipment operation.

ii. Quarterly: Check proper operation of each unit. Inspect contacts for signs of corrosion or burning. Inspect electrical conductors for condition and connection.

# INSPECTION & MAINTENANCE SCHEDULE: PAGE 13

## 6. WASTE OIL INJECTION SYSTEM:

This injection system has been designed with the least amount of components possible in an effort to reduce complexity and minimize maintenance. The only components that can "fail" are the pump, heater and the two solenoid blocking valves. The filter is considered a consumable item that requires regular replacement.

| SYMPTOM | PROBABLE CAUSE | CORRECTIVE ACTION |
|---|---|---|
| Pump does not run. | 1. Circuit breaker tripped.<br>2. Motor overloaded.<br>3. Motor overheated.<br>4. Switch turned off.<br>5. Incinerator not on.<br>6. Tank low on oil. | 1. Reset breaker in panel board.<br>2. Reset Overload Relay in J-Box.<br>3. Press overload button on motor.<br>4. Turn waste oil switch on<br>5. Turn Incinerator on.<br>6. Add oil to tank. |
| No oil pressure at pump outlet. | 1. Pump not running.<br>2. Filter clogged.<br>3. Pump lost prime.<br>4. Hand valve closed. | 1. See "Pump does not run"<br>2. Replace Filter.<br>3. Prime system. See pp 3.6.<br>4. Open all hand valves. |
| No air and oil pressure at nozzle | 1. Pump not running.<br>2. Oil under temperature.<br>3. Primary Burner not on. | 1. See "Pump does not run".<br>2. See "Oil does not get hot".<br>3. Burner must be on. |
| No oil pressure at nozzle, air pressure ok. | 1. Hand valve closed.<br>2. Solenoid valve failed. | 1. Open all hand valves.<br>2. Replace solenoid valve. |
| Oil pressure at nozzle is low. | 1. Filter dirty.<br>2. Pump pressure low.<br>3. Recirculation flow high. | 1. Replace filter.<br>2. Adjust pump pressure. See pp 3.7<br>3. Adjust recirculation flow. See pp 3.7 |
| Oil pressure at nozzle equals oil pressure at pump outlet. | Nozzle clogged. | Clean or replace nozzle. |

**NOTE:** ANY MODIFICATION OR ALTERATION TO EQUIPMENT MANUFACTURED BY **ADVANCED COMBUSTION SYSTEMS, INC.** WITHOUT AUTHORITY FROM THE FACTORY MAY VOID THE WARRANTY AND RELEASES **ACS** OF ANY LIABILITIES.

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# TROUBLESHOOTING EMISSIONS PROBLEMS: PAGE 1

## AUTOMATIC CONTROLS:

The control system regulates the combustion air, and auxiliary fuel entering the incinerator in order to optimize combustion and minimize emissions. The individual controls that accomplish this are as follows:

**1. INCINERATOR CYCLE CONTROLS:**

a. **Purge Cycle:** timer controlled cycle in which the combustion air blowers (primary, and secondary) are energized to expel any gases from the combustion chambers prior to burner ignition.

b. **Warm-up Cycle:** time and temperature controlled cycle in which the secondary combustion chamber is preheated to the minimum operating temperature prior to ignition of the primary burner and waste material. If secondary burner ignition is lost during this cycle, or at any time during burn-down cycle, the controls are reset and the primary burner ignition is delayed or extinguished.

c. **Burn-down Cycle:** timer controlled cycle in which the incinerator is given a specified time to destroy the waste material in the primary chamber. Every time the incinerator is charged these timers are reset to allow complete controlled burning of the waste added. The secondary burndown timer lags the primary to insure that the waste in the primary chamber is at fully destroyed before the completion of the secondary burn down cycle.

**2. PRIMARY CHAMBER TEMPERATURE CONTROLS:**

a. A Type 'K' thermocouple is mounted near the exit of the primary chamber. It is connected to a temperature controller. The controller has a digital display for indication and a relay contacts. The recommend setting is as follows:

   i. Primary burner (on-off control): 1400ºF

b. The action of the control is as follows:

   i. **Primary burner on-off control:** When the temperature is below this setting, the primary burner is energized until this temperature has been reached. The primary burner will switch on-off trying to maintain the setting.

**3. SECONDARY CHAMBER TEMPERATURE CONTROLS:**

a. A Type 'K' thermocouple is mounted near the exit of the primary chamber. It is connected to a temperature controller. The controller has a digital display for indication and a relay contacts. The recommend setting is as follows:

   i. Secondary hi lo temperature : 1800ºF

b. The action of the control is as follows:

   i. **Secondary hi lo temperature:** If the temperature is above this setting the secondary burners are modulated to low fire. If the temperature is above this setting then the burners modulate back up to high fire.

**4.** Even though the incineration system is equipped with the above listed automatic controls, periodic adjustments may be required to keep the system working properly. The following is a guide of actions required for a specific type of emission:

| SYMPTOM | POSSIBLE CAUSE | CORRECTIVE ACTION |
|---|---|---|
| Black Smoke | 1. Primary chamber was overcharged | 1. Reduce size of future loads |
| | 2. Excessive rate of burn in primary chamber | 2. Reduce primary chamber combustion air by adjusting manual dampers<br>or<br>Increase orifice air by adjusting manual dampers<br>or<br>Reduce primary burner firing rate by reducing auxiliary fuel input<br>or<br>Check operation and settings of temperature controls to insure proper air and burner control |
| | 3. Inadequate combustion in the secondary chamber | Increase secondary air by adjusting manual dampers<br>or<br>Increase secondary burner firing rate by increasing auxiliary fuel input<br>or<br>Check operation and settings of temperature controls to insure proper air and burner control |
| White Smoke | 1. Excessive cooling in the secondary chamber | 1. Reduce secondary chamber combustion air by adjusting manual dampers<br>or<br>Increase secondary burner firing rate by increasing auxiliary fuel input<br>or<br>Check operation and settings of temperature controls to insure proper air and burner control |

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# MANUAL ASH REMOVAL INSTRUCTIONS

**Always wear appropriate Personal Protective Equipment (PPE) when handling ash** including, but not limited to, dust mask, protective eyewear, gloves, boots, and coveralls while removing or handling ash.

Ash should be removed from the incinerator only after the ash has adequately cooled. The final cycle of the incinerator operation sequence is the *Cooldown Cycle.* During the *Cooldown Cycle* the primary blower is energized for a predetermined time to cool the ash bed and incinerator to allow removal of the ashes. After this cycle is complete, the incinerator is shut off automatically. The incinerator will continue to passively cool over time. The incinerator door should not be opened until the primary temperature display on the operator interface reads less than 428°F(*220°C*).

When loading waste or removing ash, always use good housekeeping practices. Keep the area around the incinerator free of debris.

Ash is to be removed manually. Use appropriate tools to avoid damaging the refractory lining. A combination rake/hoe with a rounded face to match the contour of the primary chamber was provided to assist in clean out of the primary chamber. The hoe portion of the tool is used to pull ashes from the rear of the chamber forward. The ashes can then be shoveled into an appropriate container and disposed of according to your waste management plan.

- Always wear PPE when handling ash.
- Primary temperature should be less than 428°F(*220°C*) before opening door.
- Chamber door must be secured in the open position to prevent unintentional closing while removing ash.
- Keep the area around the incinerator clean and free of debris.
- Take care and use appropriate tools to avoid damage to refractory lining.
- Place ash only in designated containers.
- Dispose of ash properly, according to your waste management plan.

Never use water to cool ash in the incinerator. Water can cause thermal shock to the refractory, which may shorten the life expectancy of the refractory lining.

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